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MORBIDITY &
MORTALITY:
1996 CHARTBOOK
ON CARDIOVASCULAR,
LUNG, AND BLOOD
DISEASES

The bar graph on the front cover depicts the seven
most prevalent major chronic conditions: arthritis,
orthopedic impairments, HIGH BLOOD
PRESSURE, hearing impairments, HEART
CONDITIONS, ASTHMA, and CHRONIC
BRONCHITIS determined from respondent
reporting in national health interviews.

MORBIDITY & MORTALITY: 1996 CHARTBOOK ON CARDIOVASCULAR, LUNG, AND BLOOD DISEASES

MAY 1996

FOR ADMINISTRATIVE USE

NATIONAL INSTITUTES OF HEALTH

National Heart, Lung, and Blood Institute

Foreword

The National Heart, Lung, and Blood Institute (NHLBI) conducts biomedical research related to cardiovascular, lung, and blood diseases. The Institute's research priorities are determined primarily by research potential, but they also are influenced by the magnitude, distribution, and trends of these diseases in the United States and by the potential for improving the Nation's health. Institute priorities also reflect congressional mandates and America's health needs as perceived by Institute staff and by outside advisory groups, most particularly as expressed in recommendations of the National Heart, Lung, and Blood Advisory Council.

NHLBI programs cover a wide spectrum, from support of basic laboratory research to the conduct of health education programs. The breadth of the Institute's programs is consistent with the scope of its mandate, which includes basic biology, clinical disease and medical conditions, related risk factor and lifestyle characteristics of the general population, and the Nation's blood resources. Evaluation of the Institute's program balance and program impact is a continual process that relies on assessments of morbidity and mortality from cardiovascular, lung, and blood diseases in the Nation. Consideration is given to the distribution of these diseases among the population, to their trends over time, and to related statistics on population risk factors, lifestyles, medical care, and economic impact.

Although statistics on morbidity and mortality are not directly related to the Institute's mandate, the Institute's priorities are influenced by them, and it is likely that basic research findings and applied research efforts affect national efforts to prevent and treat these diseases and thereby affect morbidity and mortality. Morbidity and mortality statistics are limited in their accuracy in measuring disease magnitude and trends. However, for some diseases that affect many people, notably coronary heart disease, cerebrovascular disease, hypertension, chronic obstructive pulmonary disease, and asthma, statistics of acceptable quality are available. They should be summarized and interpreted periodically.

This chartbook, like its predecessors, contains statistics for a limited set of common cardiovascular, lung, and blood diseases. It is anticipated that subsequent issues will continue to update these statistics and present statistics on related diseases and population characteristics and interpret their meaning for the American people.

Special thanks should be extended to Mr. Thomas Thom of the NHLBI for his time and effort in developing the material presented in this chartbook.

Claude Lenfant, M.D.
Director
National Heart, Lung, and Blood Institute

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1. Introduction

This chartbook contains morbidity and mortality statistics for the cardiovascular diseases and selected lung and blood diseases in the United States. Mortality statistics for states and selected countries are also included. The purpose of this chartbook is to describe the magnitude of the problem of these diseases with emphasis on demographic differences and time trends.

Demographic characteristics of special interest are age, sex, and the minority status. Time trends in prevalence and hospitalizations and recent changes in long-term mortality trends are of special interest. With increasing life expectancy, increasing numbers of older persons in the population, and apparent increasing survival following initial or recurrent cardiovascular disease, an increase in the numbers of persons in the population who have had a clinical episode is likely. Such individuals are at greater risk for further episodes and disability. Increasing morbidity and mortality from asthma, especially in young persons, is also of special concern because many deaths from asthma are preventable.

The first section, Background Data, contains population and life-expectancy estimates, trends in total mortality, and statistics that show leading causes of morbidity and mortality, economic costs of disease, and prevalence of risk factors. The Cardiovascular Diseases, Lung Diseases, and Blood Diseases sections contain morbidity and mortality statistics on diseases listed in the Contents. Diseases included under these three headings are listed in the first table in each section together with appropriate diagnostic codes of the ninth revision of the *International Classification of Diseases* (ICD).

Sources of Data

Most of the statistics are from the National Center for Health Statistics (NCHS), specifically: annual vital statistics of the United States, the annual National Health Interview Survey (NHIS), the National Health and Nutrition Examination Surveys (NHANES) of 1971-1975, 1976-1980, and 1988-1991, the 1960-1962 National Health Examination Survey, the annual National Hospital

Discharge Survey, and the National Ambulatory Medical Care Survey. International mortality data are from the *World Health Statistics Annual* of the World Health Organization (WHO). A complete listing of all the NCHS and WHO publications and data tapes used for statistics and ICD codes in this chartbook is beyond its scope. The References section lists specific data sources for current statistics and general references to hospital and prevalence surveys and vital statistics for earlier data years.

Population Estimates

Death rates before 1961 were obtained directly from the publications referenced. Rates for 1961-1967 were calculated by the NCHS or the National Heart, Lung, and Blood Institute (NHLBI) to reflect revised population estimates and therefore differ from published vital statistics. Rates for 1968-1991 were calculated by the NCHS or the NHLBI from public use mortality tapes and population estimates from the U.S. Bureau of the Census. Rates for 1968, 1969, and 1981-1989 are based on revised population estimates and differ from published vital statistics. U.S. Bureau of the Census publication numbers corresponding to population estimates used for death rates from 1961-1991 include the *Current Population Reports,* Series P-25, Table No. 2 for the Resident Population as of July 1 (April 1 for Census enumeration years, 1970 and 1980). The P-25 series numbers are as follows: 519 (1961-1973), 917 (1974-1980), 1095 (1980-1991), Census file RESP0792 (1992), and RESP0793 (1993).

International Classification of Diseases

Diagnostic terminology in this chartbook resembles terminology in the ninth revision of the *International Classification of Diseases* (ICD/9).[1] Codes and ICD terminology for diagnostic categories, for which time trends are shown, are listed in the appendix at the end of the chartbook for the sixth, seventh, eighth, and ninth ICD revisions. In

the presentation of statistics for years before the sixth revision, the ICD codes are obvious from the source documents listed in the References.

Quality of Data

Prevalence data, based on health interviews, rely on self-reporting of medical conditions that respondents believe a physician diagnosed for them or for members of their household. Patients who are unaware of their condition (common for hypertension) are not included in prevalence estimates based on health interviews. Any summation of the prevalence of two or more chronic conditions counts more than once those persons (an unknown number) who have more than one condition. Physician office visits are based on diagnostic mentions in physicians' records. Prevalence, hospitalization, or physician office visit estimates that have a relative standard error of 30 percent or greater, and therefore are not statistically reliable, are footnoted. If many rates are unreliable, no graph is shown.

Hospital Statistics

National trends in hospitalizations and hospital case-fatality rates have limitations in addition to diagnostic accuracy and diagnostic comparability over time. Trends may reflect changes in hospital admission practices and real changes in incidence and case fatality. Most hospital discharge statistics presented in this chartbook are confined to the first-listed discharge diagnosis reported on the face sheet of the hospital record. Discharge means discharge from the hospital either alive or dead. Patients hospitalized more than once in a year are counted more than once. The first-listed diagnosis is the closest measure available for primary diagnosis.

Cause-of-Death Statistics

Limitations of cause-of-death statistics, apart from discontinuities over time caused by revisions in the ICD, are well known. Less well known is the break in continuity in 1989 caused by insertion of cause-of-death instructions on the back of death certificates. Inaccuracies in death certification and inconsistencies in selecting and

coding the underlying cause of death create uncertainties as to the true magnitude of mortality from a specific cause compared with other causes, and, in the comparison of the same cause of death over time, between demographic groups or countries. That only one cause of death is selected as the underlying cause is both an advantage (diagnostic specificity) and a disadvantage (incomplete accounting of the contribution to mortality made by specific causes of death). Given the complexity of basing mortality statistics on tabulations of both the underlying and contributing (secondary) causes of death, only data for the underlying causes are shown in this chartbook.

ICD Revisions

For some diagnoses, the comparability of time trends, and particularly the comparability of time trends for mortality, is affected by revisions in the ICD. This influenced the selection of causes of death to include in this chartbook. Because discontinuity across recent ICD revisions is marked for coronary heart disease (CHD), a comparability ratio is applied to the age-adjusted death rates for the 1968-1978 period. The CHD age-adjusted death rates for 1968 to 1978 were multiplied by a comparability ratio of 0.8784, which was calculated for the ICD/9 to ICDA/8 revisions.[2] For total CHD mortality, it is assumed that comparability during the 1950-1993 period is reasonably good. This assumption is not made for age-, race-, or sex-specific mortality. Breaks between revisions are shown on many of the time-trend figures in which comparability is a concern. Coding rules and practices are not universal, so differences exist in diagnostic coding by countries, states, and demographic groups that affect comparability of cause-specific morbidity and mortality.

Data Presentation

Lack of uniformity and other aspects concerning data presentation in this chartbook are explained below.

Age Adjustment of Rates

Direct age adjustment of U.S. death rates follows the procedure used by the NCHS.[3] The

1940 U.S. population in 10-year age groups is used as the standard. The use of an old standard significantly understates current death rates. Age-adjusted death rates are lower because they reflect the relatively young population of 1940. This standard continues in use in official vital statistics to maintain time-trend comparability of all published age-adjusted death rates. The importance of age adjustment, regardless of the standard, is to remove age distribution differences as a factor when comparing death rates over time or among demographic groups.

The major disadvantage of age-adjusted rates is that they measure an average of rates over a given age range. Thus, age-adjusted death rates frequently reflect older age group differences when the reverse might be the case at younger ages. For example, the bar chart for rheumatic heart disease mortality has higher age-adjusted rates for whites than for blacks, but the line chart by age shows higher rates for whites only at the oldest ages. Direct age adjustment of international mortality uses the European standard population.[4]

Average Annual Percent Change

Average annual percent changes in death rates over time are calculated from log-linear regression slopes of rates for each year of a selected time period.[5] One advantage of this approach is that the results are based on rates for each year rather than the first and last years of a given period. In addition, they show average annual rates of change and allow comparison of rates of change over unequal periods. The disadvantages are that average annual percent changes are usually small and give the appearance of small differences in the comparisons. These rates may be influenced by unusually high or low values, especially if the period is short. Furthermore, they do not provide information about the levels on which they are based, which might be small, and they also sum to more than the percent change from the first to the last year in the period.

Horizontal and Vertical Scales

Comparisons between time-trend charts are complicated because ranges of the horizontal and vertical scales are not uniform and may be truncated. Vertical scales for less common diagnoses are magnified to focus on age, race, and sex differences. In these instances, it is difficult to compare diagnostic groups between charts. For example, the decline and rise over time in asthma mortality appears as marked as the rise and fall in mortality from CHD, but the vertical scale for asthma mortality is magnified compared with that for CHD. Although the amount and consistency of the recent upward trend in asthma mortality is noteworthy, the absolute change in mortality is actually quite small.

Arithmetic and Logarithmic Scales

Death rates in most time-trend graphs in the first (1990) chartbook were plotted on a logarithmic Y-scale to reflect their relative (or percentage) change over time. In the present chartbook, time trends in death rates were plotted on an arithmetic Y-scale to show their absolute change relative to zero. Note, however, that on an arithmetic scale the absolute increase or decrease for a smaller death rate might be modest compared with the change for a larger death rate, but the percentage change over time can be greater for the smaller rate. Note also that on an arithmetic scale a decline can be slowing whereas the rate of decline, if plotted on a logarithmic scale, might not be slowing. Where particularly appropriate, these differences are mentioned in the text.

Truncated Age Ranges

The horizontal scale for death rates by age is truncated to exclude the open-ended age group of 85 and older because it is difficult to place accurately on the axis and its inclusion would result in a misleading set of data points. For international comparisons, the age range 35-74 is used so that differing age distributions among countries are minimized in rate calculations. Similar age groups are used for U.S. data because they focus on premature adult morbidity and mortality.

Diagnostic Categories

Choices about which diagnostic groups to present in the various charts depended on data availability, data quality, and influences of the ICD revisions. Additional information is provided in the individual introductory sections.

Demographic Characteristics

Data on socioeconomic groups are not presented because they are extensively presented elsewhere.[6] A few charts on racial groups other than whites and blacks are presented. For some charts, notably those showing time trends, data for nonwhites had to be presented instead of data for blacks. For other charts, it was felt that presenting only data for total males and total females or for total whites and total blacks described important points that would be lost if four-way combinations were presented.

State Mortality

Death rates by state for 1989-1991 are presented for the total population for CHD, stroke, and COPD.[7] Although state mortality maps that combine all age, race, and sex groups can be misleading, the three maps included show a reasonably similar geographic pattern compared with maps that are either race and sex specific or confined to a specific age range. This situation is true even for stroke mortality, in which high rates in southern states are not due merely to the large black population. Although rankings of certain states for CHD mortality differ markedly from rankings for total heart disease, the two geographic patterns are not much different.[8]

Time Periods

Time-trend statistics are as current and extend as far back as permitted by the availability of comparable data. The focus in some charts is on the year 1963. After application of a comparability ratio to age-adjusted death rates for 1968-1978 for CHD, 1963 was determined to be the peak year before the decline began.

Abbreviations

AMI	Acute Myocardial Infarction
CHD	Coronary Heart Disease
CHF	Congestive Heart Failure
COPD	Chronic Obstructive Pulmonary Disease
CV	Cardiovascular
CVD	Cardiovascular Disease
HCFA	Health Care Financing Administration
ICD	International Classification of Diseases
ICDA	International Classification of Diseases, Adapted for Use in the United States
NCHS	National Center for Health Statistics
NEC	Not Elsewere Classified
NHANES	National Health and Nutrition Examination Survey
NHIS	National Health Interview Survey
NHLBI	National Heart, Lung, and Blood Institute
WHO	World Health Organization
ALB	Albania
ARG	Argentina
AUL	Australia
AUS	Austria
BEL	Belgium
BUL	Bulgaria
CAN	Canada
CZK	Czechoslovakia
DEN	Denmark
E&W	England and Wales
FRG	Federal Republic of Germany
FIN	Finland
FRA	France
GDR	German Democratic Republic
GER	Germany
GRE	Greece
HUN	Hungary
IRE	Ireland
ISR	Israel
ITA	Italy
JPN	Japan
MEX	Mexico
NIR	Northern Ireland
NOR	Norway
NTH	Netherlands
NZE	New Zealand
POL	Poland
POR	Portugal
ROM	Romania
RUS	Russian Federation
SCO	Scotland
SPA	Spain
SWE	Sweden
SWI	Switzerland
USA	United States of America

2. Background Data

To put the statistics in this chartbook in perspective, the tables and figures that follow give population estimates, total mortality, and life expectancy and show where cardiovascular diseases (CVD) and lung diseases rank relative to other diseases in terms of morbidity and mortality.

Certain publications and internal reports of the NHLBI contain incidence, prevalence, and mortality estimates for selected cardiovascular, lung, and blood diseases derived from various data sources. They are presented in the next few paragraphs with minimal explanation of their definition, source, or quality. Except as referenced, they should be attributed only to the NHLBI.

Cardiovascular diseases. Although it is not known how many Americans have cardiovascular disease, based on blood pressure measurements and health interviews, it is estimated that 50 million have hypertension,* more than one-third of the adult population.[9,10] The number of persons without hypertension who have other cardiovascular conditions is not known. Extrapolation of prevalence rates from health interviews in NHANES 1988-1991 to the 1993 U.S. population, an estimated 13.5 million persons have CHD.[11] Of these, 7.1 million have myocardial infarction and 7 million have angina pectoris determined from the Rose Angina questionnaire. Persons with unrecognized CHD are not included in these estimates. From the same source and extrapolation, an estimated 3.8 million persons have stroke, and 4.7 million have congestive heart failure (CHF).[12] Based on self- and proxy-reported data from the 1994 National Health Interview Survey, an estimated 765,000 persons have congenital heart disease, 2.1 million have rheumatic heart disease, 2.2 million have hardening of the arteries, 700,000 have aneurysm, 2.5 million have rapid heart or tachycardia, and 1.9 million have other heart rhythm disorders.[13,14]

Extrapolating to the Nation from the Framingham Study and using national vital statistics, it is estimated that 1,250,000 heart attacks occur each year in the United States, of which almost 500,000 result in death. About 800,000 are first attacks, while 450,000 are recurrent attacks. "Heart attack" includes overt or silent myocardial infarction, the coronary insufficiency syndrome, and CHD death. Uncomplicated angina pectoris is not included. About one-half (250,000) of the deaths occur suddenly (within 1 hour of onset of symptoms). An estimated 500,000 strokes occur in the United States each year, of which almost 150,000 result in death. About 400,000 are first strokes, while 100,000 are recurrent strokes. It is estimated that 400,000 new cases of heart failure occur each year. Congenital heart disease is thought to occur in 1 out of every 8 live births; about 32,000 new cases occur each year.

Lung diseases. Based on self- and proxy-reported chronic conditions in the 1994 National Health Interview Survey, an estimated 14.6 million Americans have asthma, 14 million have chronic bronchitis, and 2 million have emphysema.[13] An estimated 10,000 children have cystic fibrosis, and it is estimated to occur in 1 out of every 2,000 births in whites. Respiratory distress syndrome is estimated to affect 40,000 babies each year and to occur in 150,000 adults each year.

Blood diseases. Based on household health interviews, the estimated number of anemia conditions in Americans is 4.7 million.[13] (Persons with more than one form of anemia are counted more than once.) An estimated 74,000 black persons have sickle-cell anemia, 20,000 persons have hemophilia, and 1,000 persons have Cooley's anemia. Sickle-cell anemia occurs in 1 out of 540 births in black persons. Aplastic anemia occurs in an estimated 2,500 persons each year.

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* The definition of hypertension is systolic blood pressure of 140+ mmHg, or 90+ diastolic, or on antihypertensive medication. The estimate is an extrapolation to the 1991 U.S. population of unpublished prevalence rates observed in the National Health and Nutrition Examination Survey, 1988-1991, of the NCHS.

Background Data

CHART 2-1
U.S. RESIDENT POPULATION BY SEX, RACE, AND HISPANIC STATUS: POPULATION, MEAN AGE, AND PERCENT AGE 65 AND OLDER, 1994

	TOTAL POPULATION			MALE			FEMALE		
	POP. (MIL.)	MEAN AGE	PERCENT 65+	POP. (MIL.)	MEAN AGE	PERCENT 65+	POP. (MIL.)	MEAN AGE	PERCENT 65+
TOTAL	260.3	35.7	12.7	127.1	34.2	10.6	133.3	37.0	14.8
WHITE	216.5	36.6	13.7	106.1	35.1	11.4	110.3	38.0	16.0
BLACK	32.7	31.1	8.2	15.5	29.6	6.7	17.2	32.5	9.6
INDIAN*	2.2	29.3	6.2	1.1	28.5	5.2	1.1	30.1	7.2
ASIAN†	9.0	31.4	6.6	4.4	30.5	5.8	4.6	32.3	7.3
HISPANIC‡	26.1	28.2	5.5	13.2	27.4	4.5	12.9	29.0	6.5

* American Indian, Eskimo, and Aleut.
† Asian and Pacific Islander.
‡ Hispanic can be of any race.
NOTE: Estimates may not add to total due to rounding.

The mean age of minority populations is lower than the mean age of the white population. Percent of the population age 65 and older is much larger in white than in minority populations.[15]

CHART 2-2
PERCENT OF TOTAL POPULATION AGE 65 AND OLDER BY RACE AND SEX, U.S., 1994, 2000, 2015

YEAR	TOTAL	MALE	FEMALE	WHITE	WHITE MALE	WHITE FEMALE	BLACK	BLACK MALE	BLACK FEMALE
1994	12.7	10.6	14.8	13.7	11.4	16.0	8.2	6.7	9.6
2000	12.7	10.7	14.6	13.7	11.6	15.8	8.3	6.8	9.5
2015	14.8	13.2	16.3	16.1	14.4	17.8	9.9	8.6	11.0

By the year 2015, the percentage of Americans age 65 and older will be 14.8 compared with 12.7 in 1994.[15,16]

CHART 2-3
AVERAGE REMAINING LIFETIME BY AGE, RACE, AND SEX, U.S., 1993

YEAR	TOTAL	MALE	FEMALE	WHITE	WHITE MALE	WHITE FEMALE	BLACK	BLACK MALE	BLACK FEMALE
BIRTH	75.5	72.2	78.8	76.3	73.1	79.5	69.2	64.6	73.7
15	61.5	58.1	64.7	62.1	58.9	65.2	55.8	51.2	60.2
35	42.7	39.8	45.4	43.2	40.4	45.8	37.9	34.2	41.3
65	17.3	15.3	18.9	17.4	15.4	19.0	15.5	13.4	17.1
75	10.9	9.5	11.9	11.0	9.5	12.0	10.2	8.7	11.1

Average life expectancy at birth was 75.5 years in 1993—78.8 years for females compared with 72.2 years for males and 76.3 years for whites compared with 69.2 years for blacks.[15] The white-black gap exists at every age.[17]

Background Data

CHART 2-4
MOST COMMON MAJOR CHRONIC CONDITIONS
REPORTED IN NHIS: U.S., 1994
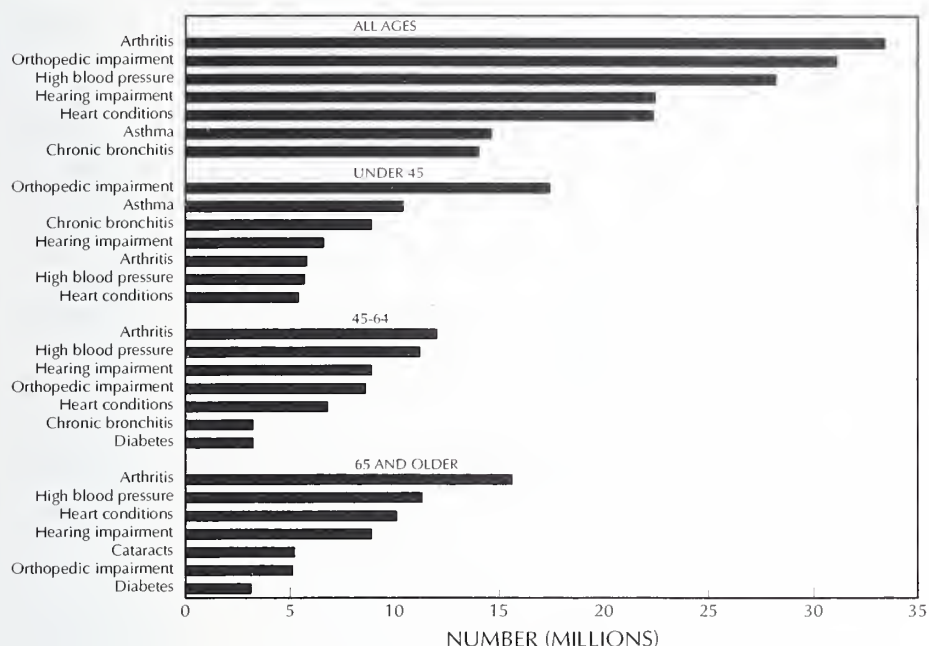
NOTE: Rankings do not include chronic sinusitis, hay fever, or migraine headache.

Under age 65, asthma, chronic bronchitis, high blood pressure, and heart conditions are among the most common chronic conditions. Older than age 65, high blood pressure and heart conditions are common.[13]

CHART 2-5
PREVALENCE OF THE LEADING CHRONIC CONDITIONS
CAUSING LIMITATION OF ACTIVITY
FROM THE NHIS, U.S., 1990-1992

CHRONIC CONDITION	PREVALENCE (MILLIONS)
Orthopedic impairments	8.8
Arthritis	6.7
Heart disease	5.4
Hypertension	2.9
Asthma	2.5
Diabetes	2.4
Intervertebral disc disorders	1.8
Mental retardation	1.4
Hearing impairments	1.3
Visual impairments	1.3
Cerebrovascular disease	1.1
Paralysis	1.1
Emphysema	0.8

Heart disease ranks as the third most prevalent chronic condition causing activity limitation.[18]

Hypertension, asthma, cerebrovascular disease, and emphysema are common chronic conditions causing activity limitation.[18]

Background Data

CHART 2-6
DEATH RATES FOR ALL CAUSES
BY RACE AND SEX, U.S., 1950-1994

AGE-ADJUSTED RATE/100,000 POPULATION

YEAR

WHITE	WHITE	BLACK	BLACK
MALE	FEMALE	MALE*	FEMALE*
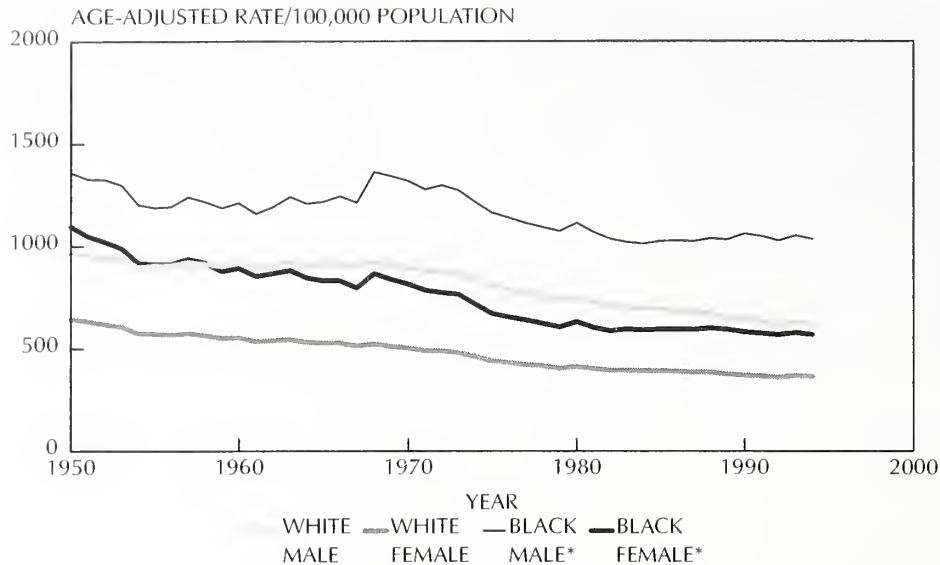
* Nonwhite from 1950-1967.
NOTE: Rates for 1994 are provisional.

During the 1950s and into the 1960s, the death rate declined by about $1/2$ of 1 percent per year.[19,20] In the 1970s, as mortality from the cardiovascular diseases declined markedly, there was a $1^1/2$ percent per year decline in total mortality.[7] Declines were less steep in the 1980s and 1990s.

CHART 2-7
DEATH RATES FOR SELECTED CAUSES,
U.S., 1950-1994

AGE-ADJUSTED RATE/100,000 POPULATION

YEAR

CHD	STROKE	LUNG CANCER	OTHER CANCER	COPD
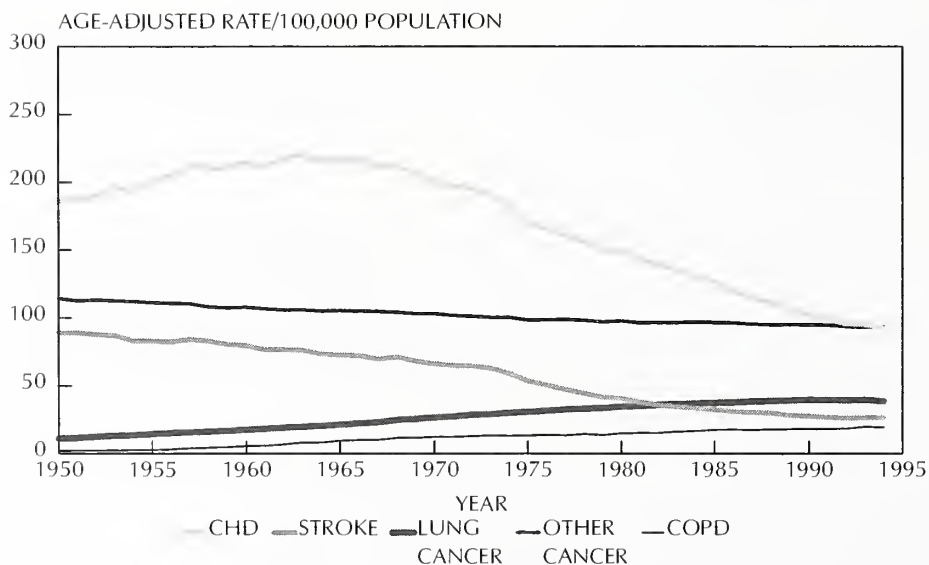
NOTE: Rates for 1994 are provisional or estimated by the NHLBI.

Among leading causes of death, lung cancer and COPD mortality are increasing as CHD and stroke continue to decline.[7]

The decline for CHD is greater than for stroke in absolute terms, but rates of decline for the two diseases are similar.

Background Data

CHART 2-8
DEATHS FROM THE LEADING CAUSES, U.S., 1994*

TOTAL	2,286,000
1 Heart disease†	734,090
2 Cancer	536,860
3 Cerebrovascular disease (stroke)	154,350
4 COPD and allied conditions	101,870
5 Accidents	90,140
6 Pneumonia and influenza	82,090
7 Diabetes	55,390
8 HIV infection	41,930
9 Suicide	32,410
10 Chronic liver disease	25,730
All other causes of death	431,140

* Provisional estimate.
† Includes 487,490 deaths from coronary heart disease.

Heart disease is the leading cause of death in the total population.[21]

Stroke is the third leading cause of death.

COPD ranks as the fourth leading cause of death in the total population.

CHART 2-9
RANK OF THE 10 LEADING CAUSES OF DEATH
BY AGE GROUP, U.S., 1994*

CAUSE OF DEATH	1-24	25-44	45-64	65-84	85+
Heart disease	5	4	2	1	1
Cancer	4	3	1	2	2
Cerebrovascular disease	9	8	4	3	3
Accidents	1	2	3	7	7
COPD†	8	—	5	4	5
Pneumonia and influenza	7	10	10	5	4
Diabetes mellitus	—	9	6	6	8
Suicide	3	5	9	—	—
Chronic liver disease	—	7	7	10	—
Atherosclerosis	—	—	—	—	6
Nephritis and nephrosis	—	—	—	8	9
Homicide	2	6	—	—	—
Septicemia	10	—	—	9	10
HIV infection	6	1	8	—	—

* Rates are provisional.
† COPD and allied conditions.

Heart disease is the fourth leading cause of death for those age 25-44, second for those age 45-64, and first for older age groups.[21]

Stroke ranks third or fourth highest in those age 45-64 and 65+.

COPD ranks fourth or fifth highest in those age 45-64 and in each subsequent age group.

Background Data

CHART 2-10
LEADING CAUSES OF DEATH,
WHITE MALES, U.S., 1994
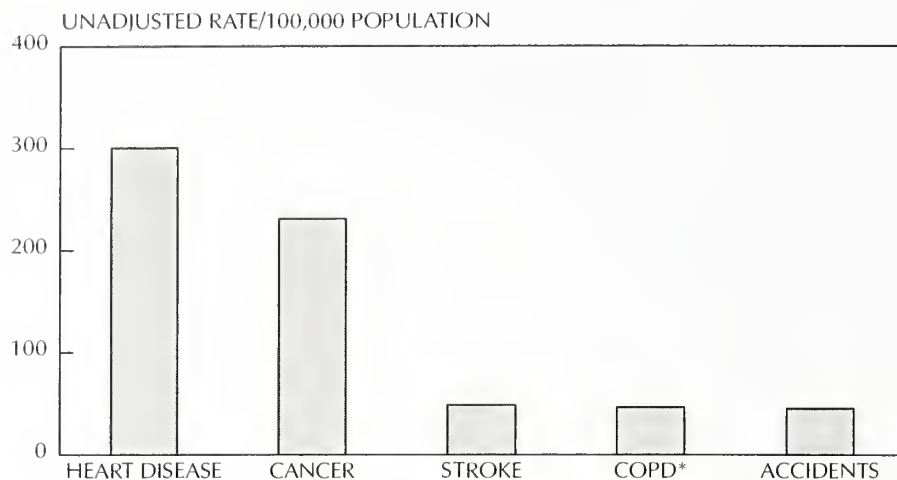
UNADJUSTED RATE/100,000 POPULATION

* COPD and allied conditions.
NOTE: Rates are provisional.

Heart disease is the leading cause of death among white males; stroke ranks third; and COPD ranks fourth.[17]

CHART 2-11
LEADING CAUSES OF DEATH,
WHITE FEMALES, U.S., 1994
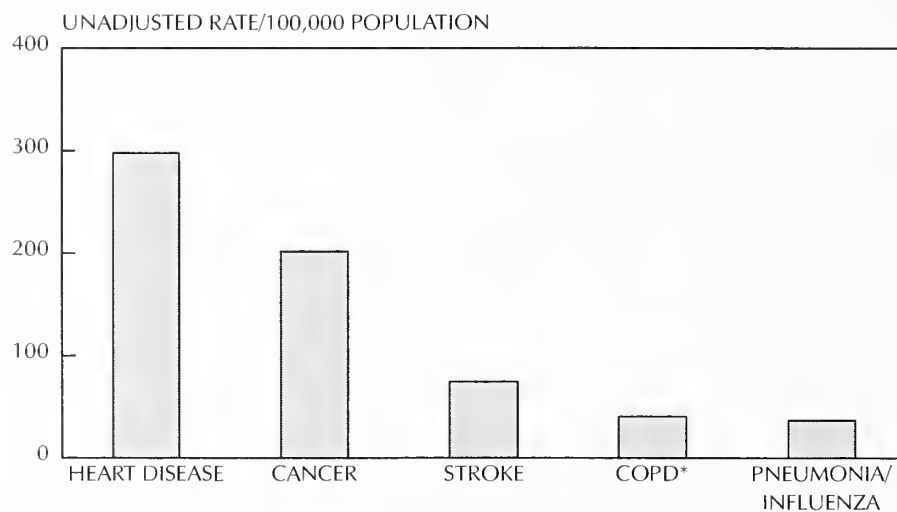
UNADJUSTED RATE/100,000 POPULATION

* COPD and allied conditions.
NOTE: Rates are provisional.

Heart disease is the leading cause of death among white females; stroke ranks third; and COPD ranks fourth.[17]

Background Data

CHART 2-12
LEADING CAUSES OF DEATH,
BLACK MALES, U.S., 1994

UNADJUSTED RATE/100,000 POPULATION

NOTE: Rates are provisional.

Heart disease is the leading cause of death among black males; stroke ranks fifth.[17]
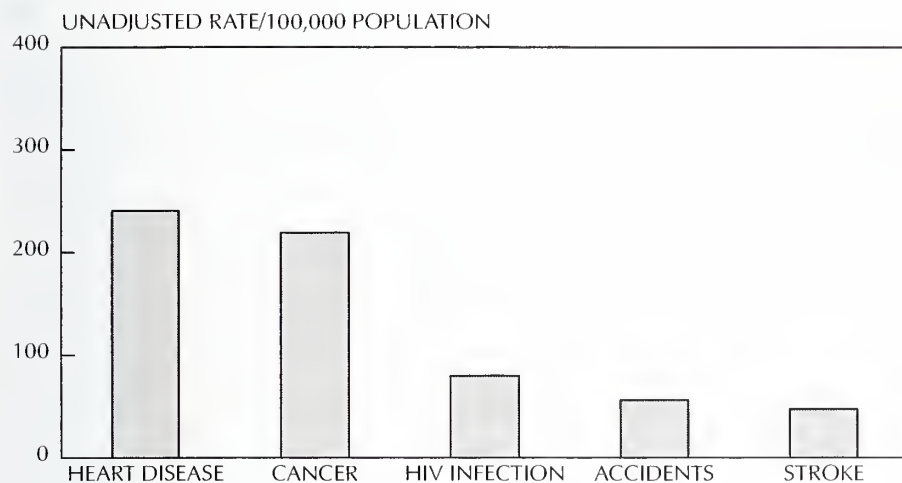
CHART 2-13
LEADING CAUSES OF DEATH,
BLACK FEMALES, U.S., 1994

UNADJUSTED RATE/100,000 POPULATION

NOTE: Rates are provisional.

Heart disease is the leading cause of death among black females; stroke ranks third.[17]

11
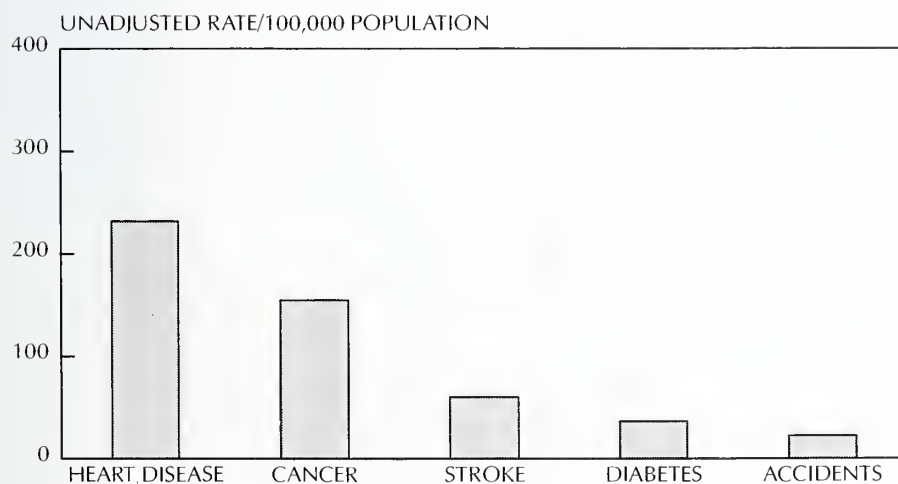
Background Data

CHART 2-14
VISITS TO OUTPATIENT DEPARTMENTS:
MOST FREQUENT DISEASES, U.S., 1993
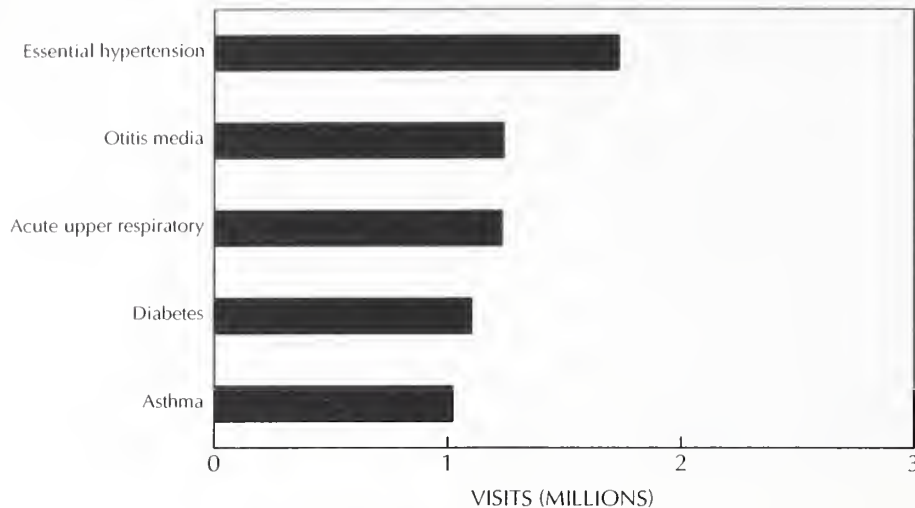
NOTE: Excludes normal pregnancy, general, postsurgical, and special examinations, and general symptoms.

Hypertension accounted for 1.7 million visits to outpatient departments in 1993. Among diseases, hypertension is the most common outpatient diagnosis; asthma ranks fifth highest.[22]

CHART 2-15
PHYSICIAN OFFICE VISITS FOR THE MOST FREQUENT
PRINCIPAL DIAGNOSES, U.S., 1992
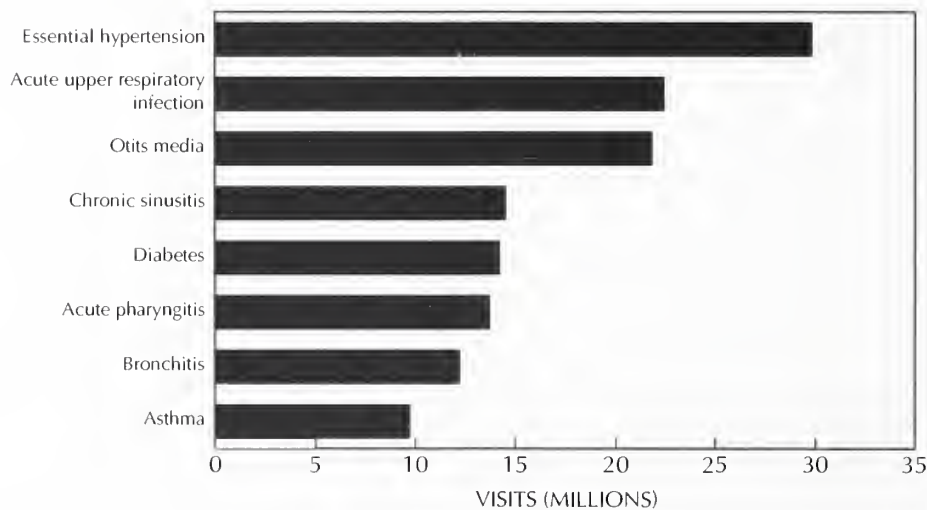
NOTE: Excludes normal pregnancy and general examination.

Hypertension accounted for almost 30 million visits to physician's offices in 1992. Among diseases, hypertension is the most common physician office visit diagnosis; bronchitis and asthma are also among the eight most common.[23]

Background Data

CHART 2-16
PERCENT CURRENTLY SMOKING, AGE 18+,
BY RACE AND SEX, U.S., 1965-1993

PERCENT

YEAR

WHITE ━BLACK ━WHITE ━BLACK
MALE   MALE   FEMALE   FEMALE
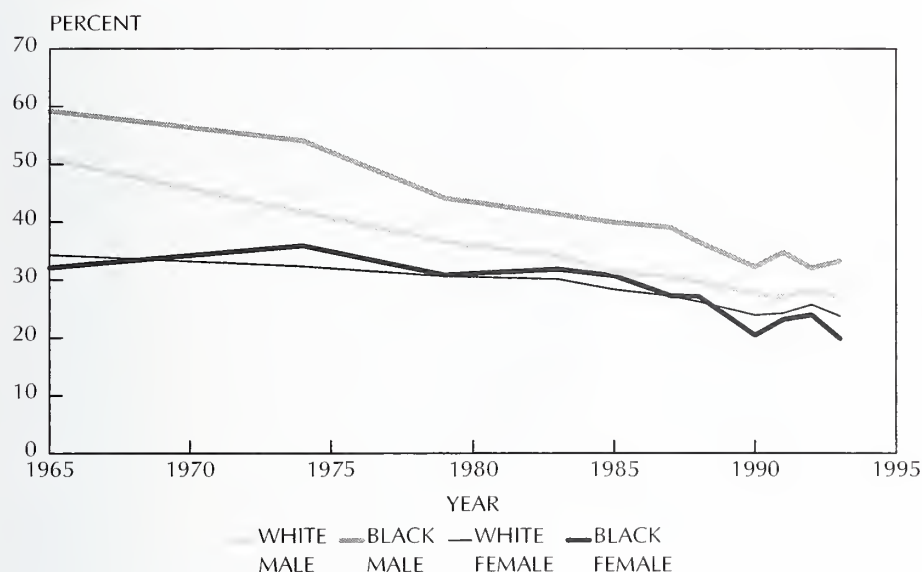
In 1993, the percent of adults (age 18+) who smoke cigarettes was 33 percent in black males, 27 percent in white males, 24 percent in white females, and 20 percent in black females.[24] Declines since 1965 have been much steeper in males than females, both in an absolute amount and on a percentage basis.

CHART 2-17
PERCENT WITH HIGH SERUM CHOLESTEROL*
FOR AGE 20-74, RACE, AND SEX, U.S., 1960-1991

PERCENT

WHITE MALE   WHITE FEMALE   BLACK MALE   BLACK FEMALE

■1960-1962 ☐1971-1974 ▨1976-1980 ▨1988-1991
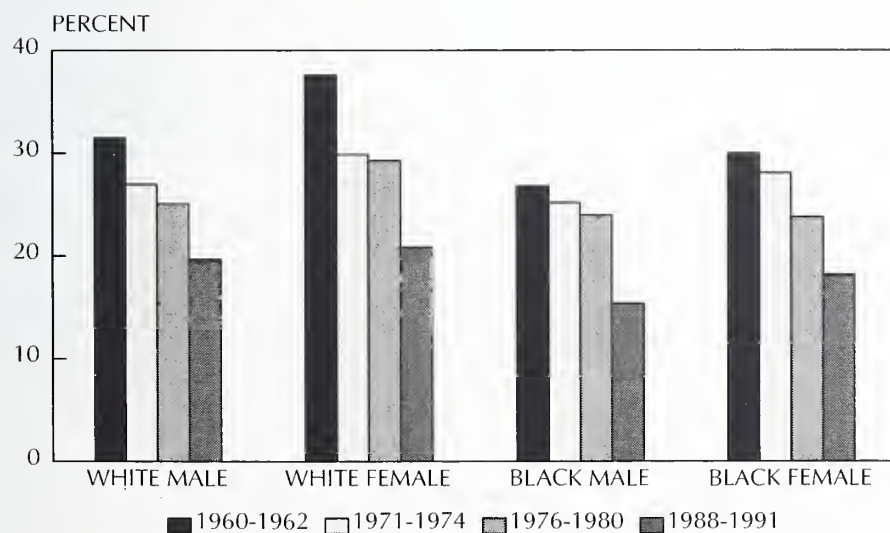
* 240 mg/dL or greater.

A slightly larger proportion of females than males (age 20-74) have high total serum cholesterol values.[24] Declines in these proportions have occurred between the early 1960s and late 1970s.

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Background Data

CHART 2-18
PERCENT OVERWEIGHT*
FOR AGE 20-74, RACE, AND SEX, U.S., 1960-1991

PERCENT†

■ 1960-1962 ☐ 1971-1974 ▨ 1976-1980 ▨ 1988-1991
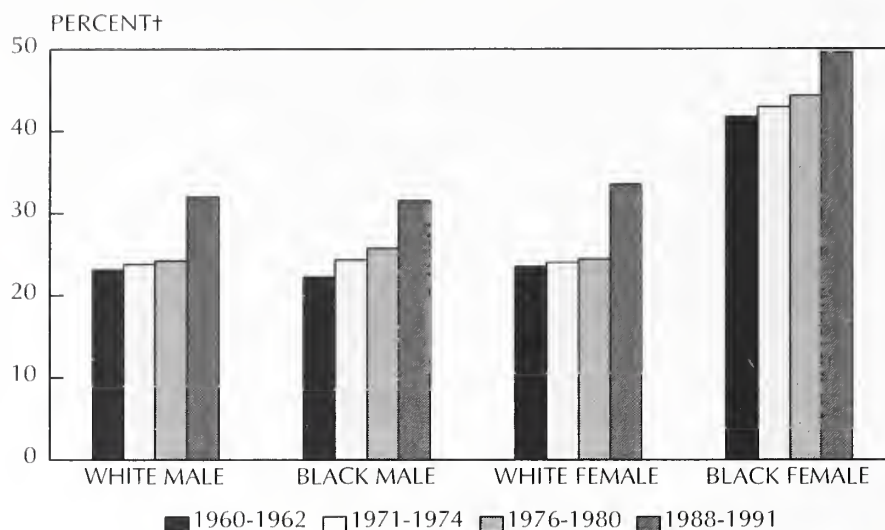
* Based on body mass index of 27.8 kg/m² for males and 27.3 for females.
† Age-adjusted.

The proportion of females, especially black females, who are overweight is greater than the proportion of males who are overweight.[24] For each sex-race group, the trend in the prevalence of overweight males and females is upward from the early 1960s, particularly in the 1988-1991 period.

CHART 2-19
ECONOMIC COST OF CV, LUNG, AND BLOOD DISEASES
IN BILLIONS OF DOLLARS, U.S., 1993

DISEASE	TOTAL	DIRECT	MORBIDITY	MORTALITY
Total CVD	210.0	125.7	21.8	62.5
Heart disease	133.2	71.9	11.8	49.5
Coronary	50.9	32.7	7.8	30.4
Congestive heart failure*	18.9	17.8	*	1.1
Stroke	35.5	21.9	5.6	8.0
Hypertensive disease*	22.0	19.1	*	2.9
Selected lung disease	91.0	61.0	16.8	13.2
COPD	23.9	14.7	4.7	4.5
Asthma	12.6	9.8	1.9	0.9
Selected blood disease	7.3	5.6	0.5	1.2
Anemias	4.7	3.7	0.4	0.6

* No estimate made for indirect morbidity costs. Most costs for hypertensive disease are included in total heart disease.
NOTE: Direct costs are expenditures for hospital care, physician and other professional care, home care, nursing home care, and drugs. Indirect morbidity costs represent lost earnings due to illness. Indirect mortality costs represent lost future earnings by those who died from the given disease in 1993.

The national economic impact of cardiovascular, lung, and blood diseases is in the billions of dollars measured in annual expenditures for health care and lost productivity due to illness and death.[7,25-33]

These estimates are made by the NHLBI using primarily mortality and health survey data from the NCHS, health expenditure data from the HCFA, and income data from the U.S. Bureau of the Census. Costs for these diseases as secondary causes of morbidity and mortality are not included.

3. Cardiovascular Diseases

The diagnostic group, Cardiovascular Diseases, is used in this chartbook to mean diseases of the circulatory system as coded in the ICD. Depending on data availability, ICD categories for congenital anomalies of the circulatory system are also included. The first table in this section gives a relatively detailed listing of cardiovascular diseases and ninth revision ICD codes. The terminology used is modified from the exact ICD terminology listed in the Appendix. The first table includes estimates of hospital discharges, lengths of stay, physician office visits, and deaths for 1993 for these diagnostic groups. The first pie chart on page 17 shows that 52.4 percent of all CVD deaths in 1993 were due to CHD, 15.5 percent to stroke, and 4.6 percent to other diseases of the arteries. Therefore, approximately three-fourths of all CVD deaths are atherosclerotic related. Graphs and tables in this chartbook describe morbidity and mortality for most of the following cardiovascular diseases.

Heart Disease

Although there are many forms of heart disease, as a disease category "heart disease" is the number one cause of death and a common cause of morbidity. Statistics for heart disease are shown in this chartbook because it is a major diagnostic category that is comparable over time and among demographic groups, including states. Because heart disease includes hypertensive and rheumatic heart diseases, both of which have long been declining as causes of death, the rise in mortality from total heart disease in the 1940s and 1950s was modest compared with the more rapid rise for its major component, CHD.[28]

Coronary Heart Disease

CHD accounts for two-thirds of the deaths from all forms of heart disease (refer to the second pie chart on page 17). In terms of mortality tabulations, there are numerous forms of heart disease; however, diagnostic information available at the time of death is often insufficient to distinguish accurately among forms of the disease. Moreover, revision of the ICD has led to changes in classifying deaths to either CHD or another form of heart disease (refer to the Introduction about a comparability ratio for CHD). The discontinuity in trend affects the comparison of levels of CHD mortality among race-sex groups. Depending on the ICD revision, CHD age-adjusted death rates may be higher in black males than in white males. They are slightly higher in black males in the current revision; however, they are clearly lower in white than in black females across all revisions. The ICD term "ischemic heart disease" and the preferred term "coronary heart disease" are considered to be identical for the purposes of morbidity and mortality in this chartbook. The subcategory "acute myocardial infarction" (AMI) is a useful category for hospitalization and physician office visit statistics but not for prevalence or mortality (although mortality from AMI has been declining much more rapidly than mortality from the more chronic forms of CHD). Because the subgroup "angina pectoris" is a notoriously poor diagnostic category in standard morbidity and mortality statistics, its presentation is limited in this chartbook.

Congestive Heart Failure

Congestive heart failure is a sequelae of various heart diseases. It is a heart "condition," not a heart "disease." Thus, it is not precise to classify deaths to congestive heart failure as the underlying cause of death. However, the condition is becoming increasingly common in prevalence, hospitalizations, and mortality. It is highlighted by an extraordinarily poor prognosis. Hospitalization and mortality for congestive heart failure are increasing (until very recently), despite declining mortality for other heart diseases. Congestive heart failure is more common as a contributing cause of death than as an underlying cause of death.

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Cardiomyopathy

In 1993, more than 26,000 deaths were classified to cardiomyopathy as the underlying cause of death. However, no consensus exists on classification and diagnostic criteria for this disease. It is assumed that this limitation has little affect on mortality differences by age, race, and sex.

Other Heart Diseases

Pulmonary embolism, conduction disorders, cardiac dysrhythmias, and acute and subacute endocarditis are other heart diseases of interest, but measures of their morbidity, and especially their mortality, are of uncertain quality. Therefore, presentation of statistics on them is limited in this chartbook.

Hypertensive Disease

The category "hypertensive disease," ICD/9 codes 401-405, is primarily essential hypertension (401) in morbidity statistics and hypertensive heart disease (402, 404) in mortality statistics. Mortality statistics are not presented for hypertensive disease because it is not a distinct underlying cause of death. Its presence on death certificates is often arbitrary, and its selection as the underlying cause of death is often characterized by a lack of good diagnostic information at the time of death. Where death rates for hypertensive heart disease have been presented, the trends have been markedly downward.[28] The most important statistics on hypertension are prevalence and the proportion of hypertensive persons who are aware of their condition, on medication for it, and have it under control.

Cerebrovascular Diseases (Stroke)

The third leading cause of death is cerebrovascular disease (stroke). Only a small proportion of deaths from stroke can be classified to cerebral hemorrhage, occlusion, thrombosis, or embolism. Most are coded to ill-defined forms of cerebrovascular disease[15] (refer to the third pie chart on page 17). Thus, mortality for the entire category is presented.

Diseases of Arteries

The ICD term "diseases of arteries" is considered in this chartbook to reflect statistics on peripheral vascular disease. In prevalence statistics in which household respondents are queried, the closest term is "hardening of the arteries."

Congenital Anomalies of the Circulatory System

This category is in the "Congenital Anomalies" chapter of the ICD, but where possible, it is included in this chartbook with CVD statistics. Part of this category is congenital heart disease (ICD/9 codes 745-746), and part is other congenital anomalies of the circulatory system (747). Because most deaths from congenital anomalies occur at younger than age 1, the preferred mortality tabulation is the infant mortality rate rather than the usual death rate.

Atrial Fibrillation

The number of hospitalized patients presenting with atrial fibrillation has been increasing. It is not known how many deaths are attributed to this cardiac rhythm disorder because diagnosis based only on death certificate information is inadequate.

CHART 3-1
CVD DEATHS, PERCENT
BY SUBGROUP, U.S., 1993

CHD 51.2%

OTHER CVD 2.3%

DISEASES OF ARTERIES 4.3%

STROKE 15.7%

OTHER
HEART DISEASES 26.5%
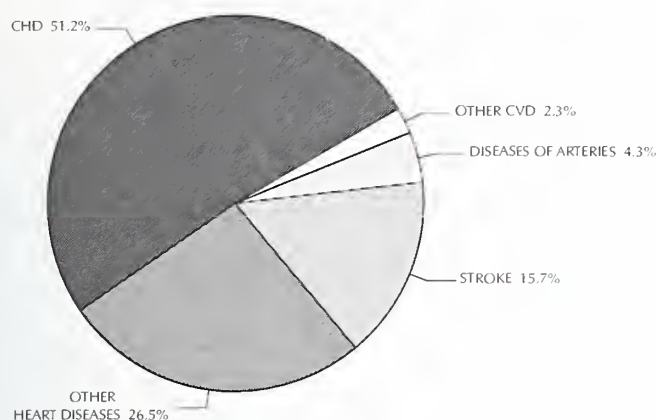
Total Deaths = 957,598 (100%), including congenital
cardiovascular disease, ICD/9 codes 745-747.

CHART 3-2
HEART DISEASE DEATHS,
PERCENT BY SUBGROUP, U.S., 1993

OTHER 13.6%

CONGENITAL 0.6%

RHYTHMIC 5.8%

PULMONARY EMBOLISM 1.2%

HYPERTENSIVE 3.4%

RHEUMATIC 0.8%

CARDIOMYOPATHY 3.5%

CONGESTIVE
HEART FAILURE 5.6%

CHD 65.5%
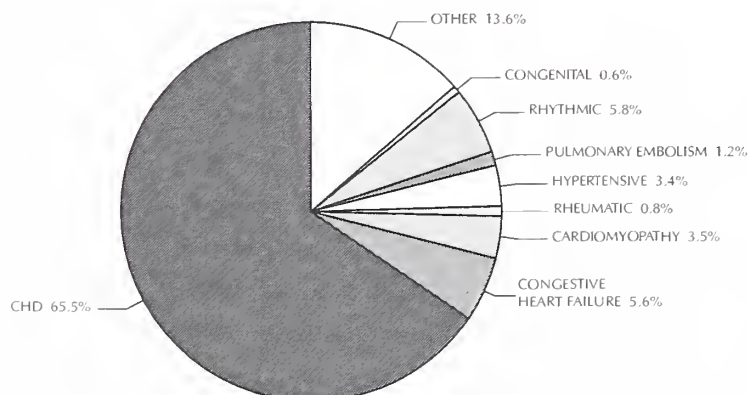
Total Deaths = 747,714 (100%), including 4,254 from
congenital heart disease, ICD/9 codes 745, 746.

CHART 3-3
STROKE DEATHS,
PERCENT BY SUBGROUP, U.S., 1993

OCCLUSION 11.4%

OTHER HEMORRHAGE 14.3%

ACUTE ILL-DEFINED 57.4%

SUBARACHNOID HEMORRHAGE 4.4%

LATE EFFECTS AND TRANSIENT CEREBRAL ISCHEMIA 5.8%

OTHER ILL-DEFINED 6.7%
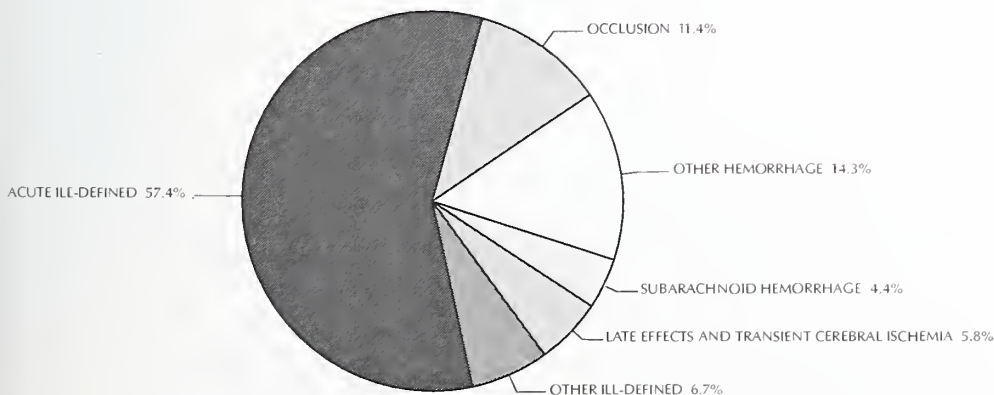
Total Deaths = 143,481 (100%).

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Cardiovascular Diseases

CHART 3-4
NUMBER OF HOSPITALIZATIONS, PHYSICIAN OFFICE VISITS, AND DEATHS
FOR CVD IN THE U.S., 1993

DIAGNOSTIC CATEGORY	ICD/9 CODES	HOSPITALIZATIONS FIRST-LISTED DISCHARGE (000)	LENGTH OF STAY (DAYS)	PHYSICIAN OFFICE VISITS (000)	DEATHS
Total CVD	390-459, 745-747	5,677	6.7	57,695	957,598
Heart disease	390-398, 402, 404-429	3,951	6.3	19,368	743,460
Rheumatic heart disease	390-398	25	8.9	252	5,743
Hypertensive heart disease	402-404	114	7.6	844	25,501
Coronary heart disease	410-414	2,079	5.9	9,222	490,063
Acute myocardial infarction	410	745	7.4	407	227,456
Angina pectoris	413	181	3.6	1,891	984
Other CHD	411, 412, 414	1,153	5.3	6,924	261,623
Diseases of pulmonary circulation	415-417	69	9.0	51	11,727
Pulmonary embolism	415.1	59	9.2	8	8,955
Other	415.0, 416-417	10	7.9	43	2,772
Acute and subacute endocarditis	421	10	18.3	—	892
Cardiomyopathy	425	33	6.4	484	26,214
Congestive heart failure	428	875	7.5	2,844	41,819
Arrhythmias	426, 427	606	4.9	3,614	43,431
Other heart diseases	420, 422-424, 429	132	6.4	2,057	98,070
Other hypertensive diseases	401, 403	269	4.4	28,366	11,243
Cerebrovascular disease	430-438	841	8.4	2,106	150,108
Diseases of arteries	440-448	265	4.4	2,666	43,277
Atherosclerosis	440	73	10.1	360	17,272
Aortic aneurysm	441	51	10.3	246	16,475
Other diseases of arteries	442-448	141	7.9	2,060	9,530
Diseases of veins	451-459	297	5.6	4,798	4,122
Deep vein thrombosis	451.1	27	8.4	—	579
Other diseases of veins	451.0, 451.2-459	270	5.3	4,798	3,543
Congenital anomalies of CV system	745-747	44	8.4	131	5,388
Congenital heart disease	745-746	31	8.3	94	4,254
Other congenital CV disease	747	13	8.8	37	1,134

NOTE: Estimates of hospitalizations and physician office visits are subject to sampling variability. Estimates of hospitalizations below 50,000 have a relative standard error of more than 11 percent. Estimates of physician office visits below 588,000 have a relative standard error of more than 30 percent. Compiled from references 17, 26, 27.

Cardiovascular Diseases

CHART 3-5
PERCENT CHANGE IN DEATH RATES* SINCE 1950, U.S., 1950-1994

PERCENT CHANGE

CHD†━STROKE ━NON-CVD‡
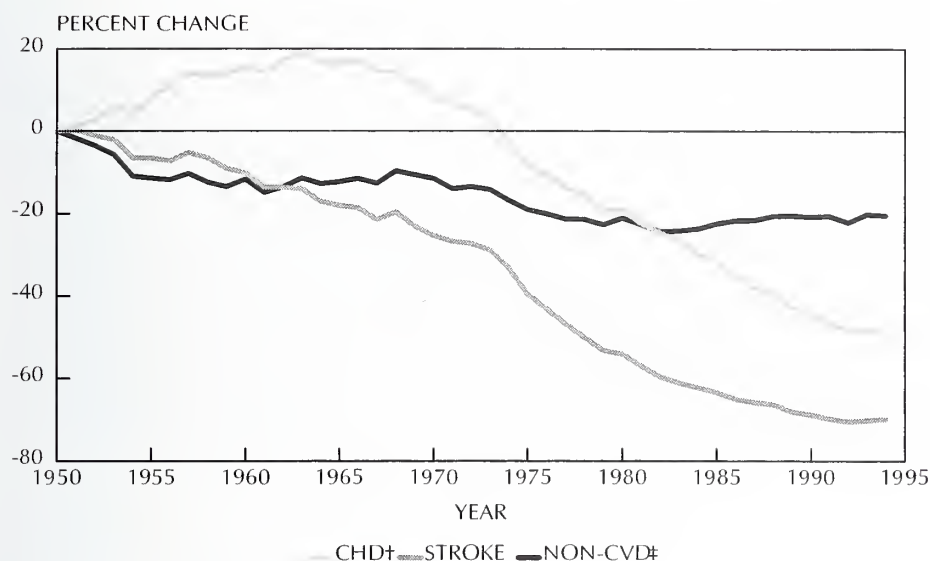
* Age-adjusted.
† Comparability ratio applied to rates for years 1968-1978.
‡ Total mortality minus CVD (excluding congenital).
NOTE: 1994 data are provisional or estimated by the NHLBI.

There has been a dramatic rise and fall in coronary heart disease mortality.[7,17,20]

The decline in stroke mortality accelerated markedly in the 1970s.

After a modest decline for noncardiovascular diseases, there has been a recent increase.

CHART 3-6
DEATH RATES AND PERCENT CHANGE FOR ALL CAUSES AND CVD, U.S., 1963 AND 1994

CAUSE OF DEATH	RATE/100,000 POP.* 1963	1994	1963-1994 DIFFERENCE	PERCENT CHANGE	% CONTRIBUTION TO TOTAL DECLINE
All causes	756.9	508.4	-248.5	-32.8	100
CVD†	388.6	177.8	-210.8	-54.2	85
CHD	220.3	92.4	-127.9	-58.0	51
Stroke	76.4	26.7	-49.7	-65.0	20
Other CVD	91.9	58.7	-33.2	-36.1	13
Non-CVD	368.3	330.6	-38.0	-10.3	15

* Age-adjusted.
† Excludes congenital anomalies of the circulatory system.
NOTE: Rates for 1994 are provisional or estimated by the NHLBI.

Eighty-five percent of the decline in total mortality from 1963 to 1994 is due to CVD decline.[7,17,20]

CHD mortality declined 58 percent from 1963 to 1994.

Stroke mortality declined 65 percent from 1963 to 1994.

Cardiovascular Diseases

CHART 3-7
AVERAGE ANNUAL PERCENT CHANGE IN AGE-ADJUSTED DEATH RATES
FOR ALL CAUSES AND CVD,
U.S., 1965-1994

PERIOD	ALL CAUSES	TOTAL CVD*	CHD†	STROKE	OTHER CVD	ALL OTHER CAUSES
1965-1970	-0.6	-1.5	-1.5	-1.7	-1.2	+0.3
1970-1975	-2.3	-3.1	-3.1	-3.8	-2.4	-1.6
1975-1980	-1.7	-2.8	-2.7	-5.6	-1.2	-0.7
1980-1985	-1.2	-2.4	-3.3	-4.4	+0.5	-0.4
1985-1990	-1.0	-3.3	-4.0	-3.1	-2.3	+0.5
1990-1994	-0.5	-1.5	-2.5	-0.8	-0.1	+0.1

* Excludes congenital anomalies of the circulatory system.
† Comparability ratio applied to rates for 1968-1978.
NOTE: Death rates for 1994 are provisional or estimated by the NHLBI.

Declines in CVD mortality continue but have slowed.[7,17,20] Averge annual percent declines between 1990 and 1994 are: 1½ percent for CVD, 2½ percent for CHD, and less than 1 percent for stroke.

CHART 3-8
AVERAGE ANNUAL PERCENT CHANGE IN AGE-ADJUSTED DEATH
RATES FOR ALL CAUSES AND CVD BY RACE AND SEX,
U.S., 1989-1993

	TOTAL	WHITE MALE	WHITE FEMALE	BLACK MALE	BLACK FEMALE
All causes	-0.9	-1.1	-0.7	-0.9	-0.8
Cardiovascular disease*	-2.1	-2.3	-1.8	-2.6	-1.7
Heart disease	-2.1	-2.4	-1.9	-2.0	-1.5
Coronary	-2.9	-3.1	-2.8	-2.4	-1.9
CHF	+0.9	+0.7	+1.8	-0.6	-1.0
Stroke	-1.9	-1.7	-1.8	-2.7	-3.3
All non-CVD	-0.2	-0.4	-0.1	-0.1	-0.1

* Major cardiovascular diseases (ICD/9 codes 390-448).

Between 1989 and 1993, mortality declines from coronary heart diseases have been faster in males than in females and faster in whites than in blacks. They have also been faster than declines for stroke. CHF mortality declined little in blacks and increased in whites[7,17]

Cardiovascular Diseases

CHART 3-9
DEATHS AND DEATH RATES FOR MAJOR CARDIOVASCULAR DISEASES, U.S., 1979-1995

DEATHS IN THOUSANDS (BARS)   RATE/100,000 POPULATION (LINES)

YEAR

▬UNADJUSTED ▭AGE-ADJUSTED

NOTE: ICD codes 390-448. Total CVD would include about 10,000 more deaths.
Rates are per 100,000 population; adjustment is to 1940 standard.
Data for 1994 are provisional; data for 1995 are for 12 months ending June.
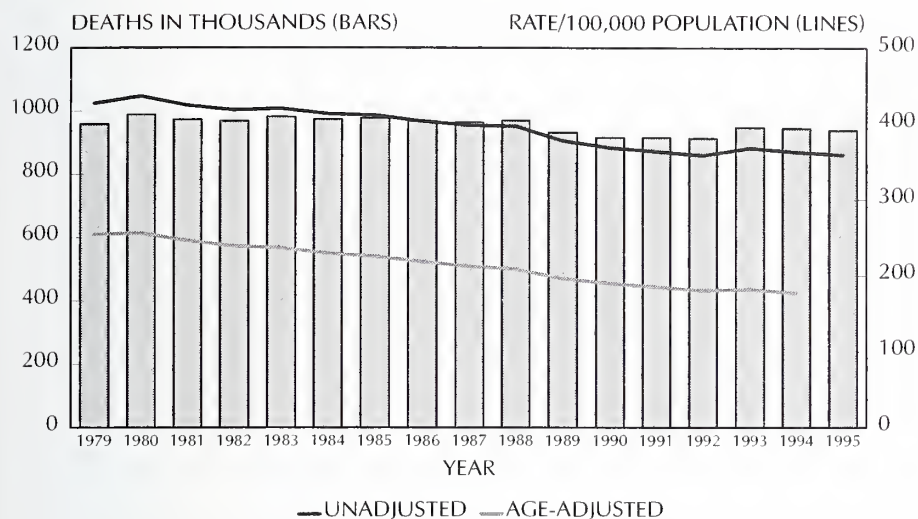
Following an unusual and substantial increase in the number of deaths from cardiovascular disease in 1993, the decline in deaths and death rates appears to have continued but at a slower pace than before.[3,7,21,34]

CHART 3-10
PERCENTAGE OF ALL DEATHS DUE TO CVD BY AGE, U.S., 1993

PERCENT

AGE
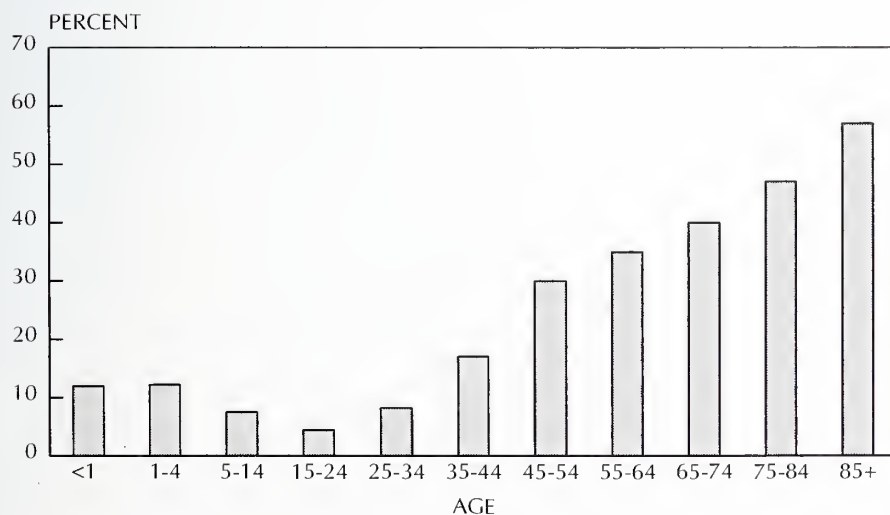
The percentage of all deaths due to CVD rises with age.[17] It is: 17 percent at age 35-44, 30 percent at age 45-54, 35 percent at age 55-64, 40 percent at age 65-74, 47 percent at age 75-84, and 57 percent at age 85 and older.

Total Heart Disease

CHART 3-11
PREVALENCE OF HEART DISEASE BY AGE AND SEX,
U.S., 1988-1990 AND 1991-1993

PREVALENCE IN PERCENT

AGE
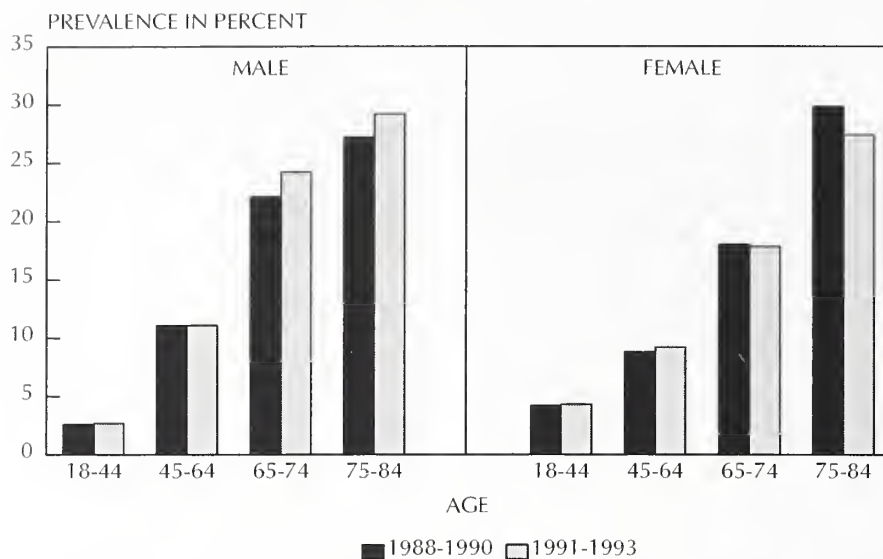
■ 1988-1990 □ 1991-1993

NOTE: Person counts based on self report in health interviews.

Changes in prevalence of heart disease by age and sex from the 1988-1991 and 1991-1993 NHIS are modest and in no consistent direction.[14]

CHART 3-12
DEATH RATES FOR HEART DISEASE BY ETHNICITY,
RACE, AND SEX, U.S., 1980-1992

RATE/100,000 POPULATION

YEAR

── BLACK ══ WHITE ── INDIAN ── HISPANIC - - ASIAN
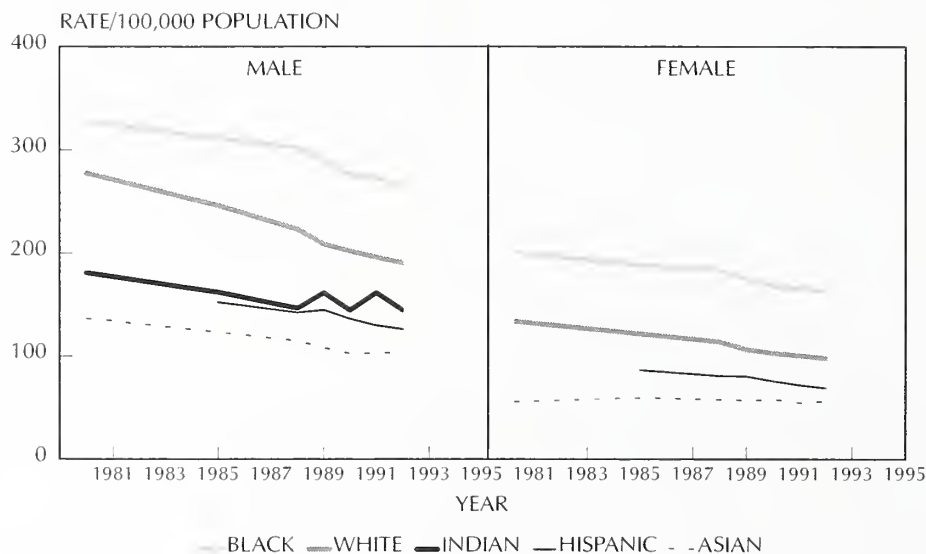
NOTE: Rates are age-adjusted. Rates for female Indians are not reliable.

Except for Asian females, the death rate for heart disease declined between 1980 and 1992 in all race/ethnicity groups in males and females: whites, blacks, American Indians, Asians, and Hispanics.[24]

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Total Heart Disease

CHART 3-13
DEATH RATES FOR HEART DISEASE
BY RACE AND SEX, U.S.,1994

AGE-ADJUSTED RATE/100,000 POPULATION

TOTAL ☐WHITE ▨BLACK
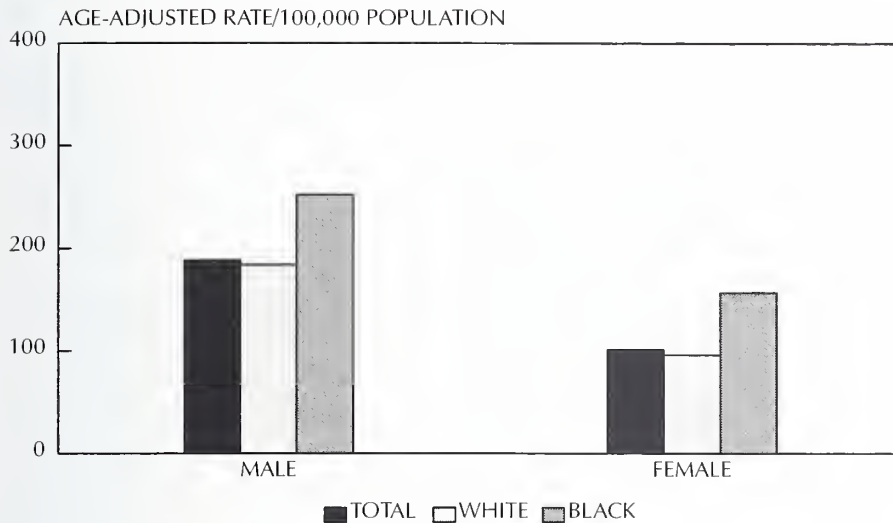
Age-adjusted death rates for heart disease are:[17]

- **Thirty-seven percent higher in black males than in white males.**

- **Sixty-three percent higher in black females than in white females.**

- **Eight-five percent higher in males than in females.**

CHART 3-14
DEATH RATES FOR HEART DISEASE
BY AGE, RACE, AND SEX, U.S., 1994

RATE/100,000 POPULATION

AGE

WHITE ―WHITE ―BLACK ―BLACK
MALE   FEMALE   MALE   FEMALE
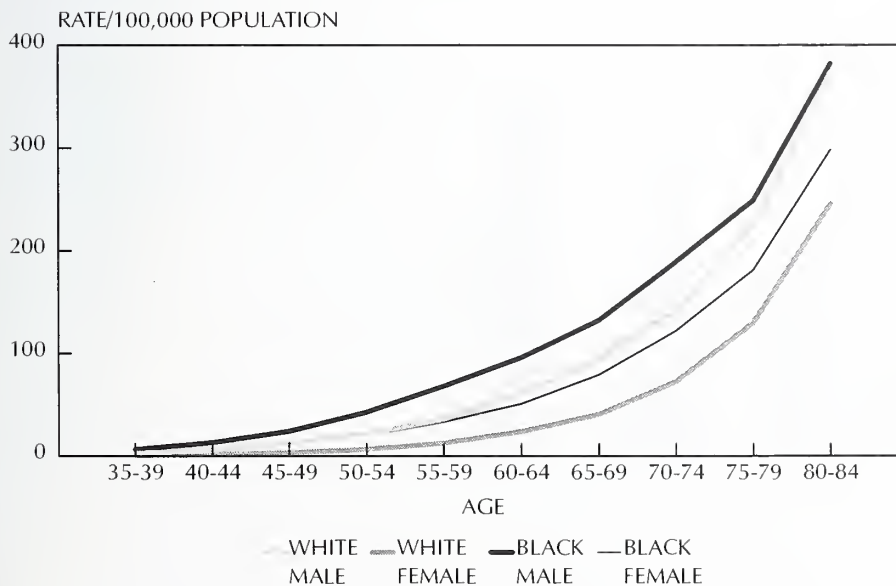
Age-specific death rates for heart disease are:[17]

- **Higher in black males than in white males until age 85.**

- **Higher in black females than in white females until age 85.**

23

Coronary Heart Disease

CHART 3-15
PREVALENCE OF CHD, NHIS, U.S., 1972-1994

CONDITIONS (MILLIONS)   CONDITIONS/1,000 POPULATION

☐ NUMBERS ━ RATE
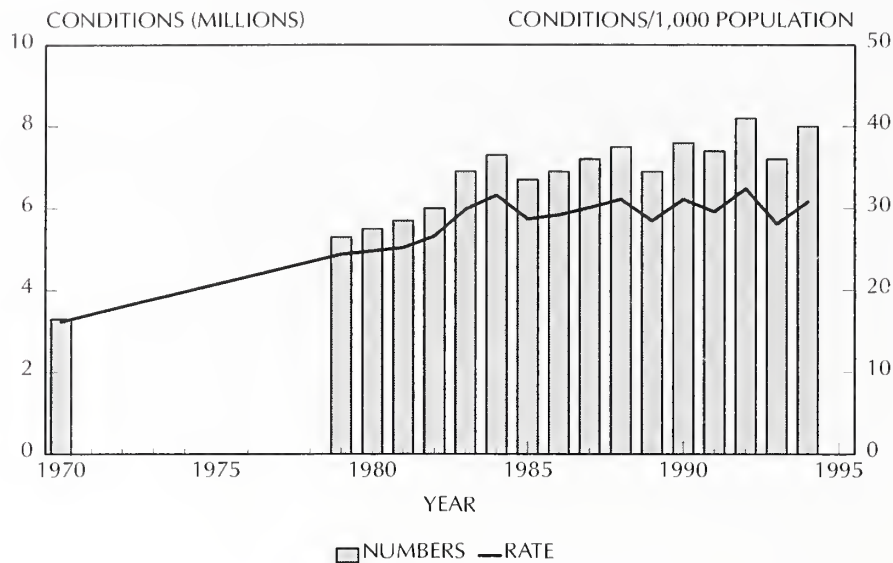
Source: NHIS. Persons with MI and angina are counted twice.

The prevalence of CHD increased since 1970. It continues to increase, but since 1984, the increase has been modest and the prevalence rate is no longer increasing.[13,35]

CHART 3-16
PREVALENCE OF CHD BY AGE AND SEX,
NHANES III, U.S., 1988-1991

PERCENT OF POPULATION

■ MEN ☐ WOMEN
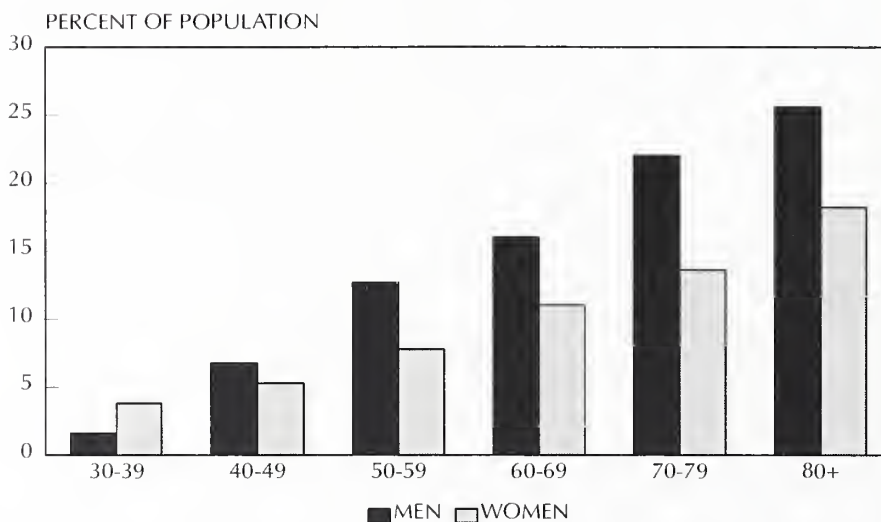
Prevalence of CHD is estimated from health interviews in NHANES, combining reported myocardial infarction and persons with angina pectoris determined from the Rose Angina Questionnaire. Prevalence is substantial even among middle-aged adults.[11]

Coronary Heart Disease

CHART 3-17
PREVALENCE OF HEART DISEASE AND CHD,
AGE 45-64 AND 65+, U.S., 1979-1994

PREVALENCE/1,000 POPULATION

YEAR

HEART   HEART   CHD   CHD
DISEASE   DISEASE   AGE 65+   AGE 45-64
AGE 65+   AGE 45-64
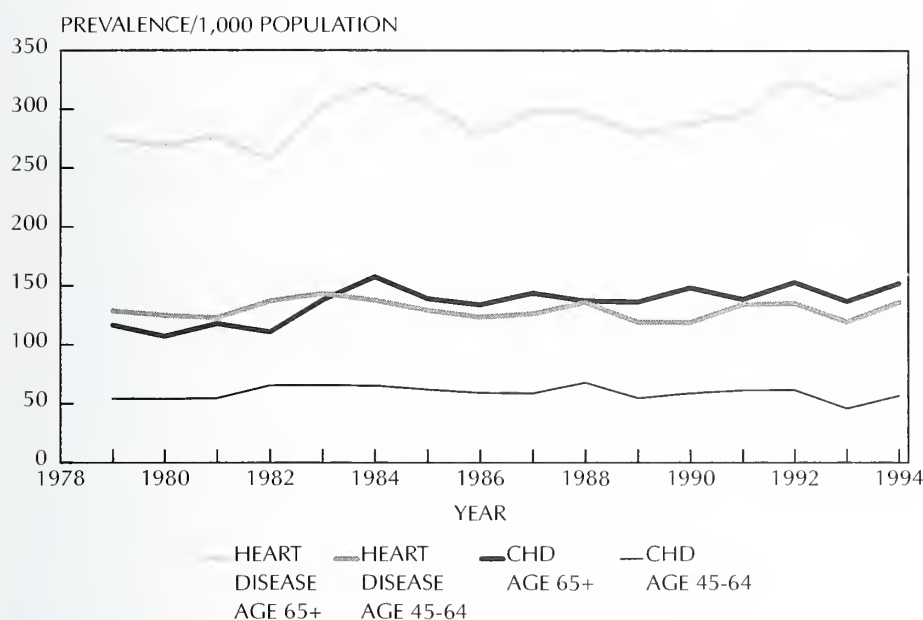
Since 1979, trends in the prevalence of CHD and heart conditions from the NHIS are not changing appreciably for those age 45-64.[13,35]

There is a modest upward trend in prevalence for those age 65 and older.

CHART 3-18
HOSPITALIZATION RATES FOR AMI,
AGE 45-64 AND 65+, U.S., 1965-1993

RATE/10,000 POPULATION

YEAR

45-64   65+
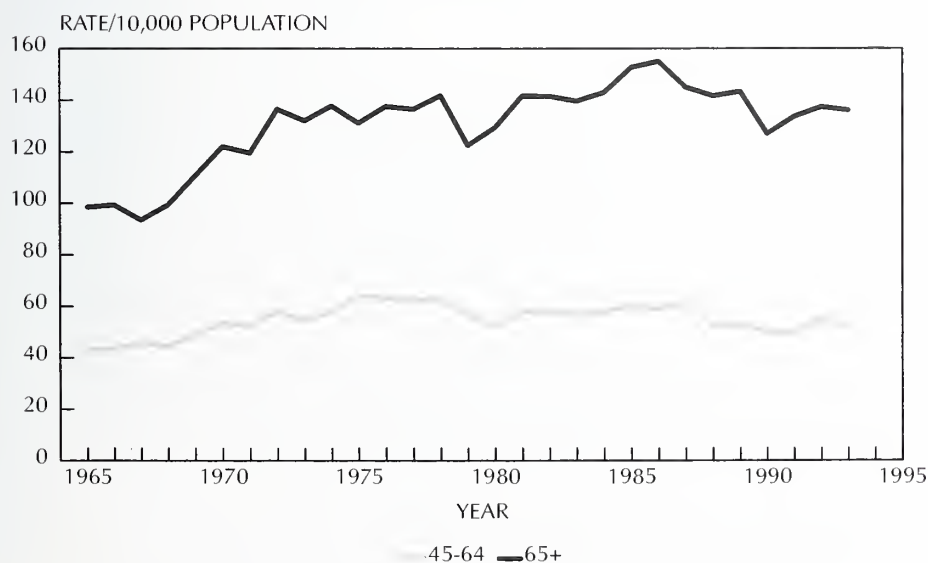
Rates of hospitalization for AMI are increasing modestly, with increases most notable for those older than age 65.[26,36]

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Coronary Heart Disease

CHART 3-19
HOSPITAL CASE-FATALITY RATES FOR AMI AND
OTHER CHD, AGE 45-64 AND 65+, U.S., 1970-1993

PERCENT DISCHARGED DEAD

YEAR

AMI AGE 65+   AMI AGE 45-64   OTHER CHD AGE 65+   OTHER CHD AGE 45-64

Between 1970 and 1993, hospital case-fatality rates for CHD declined substantially.[36]
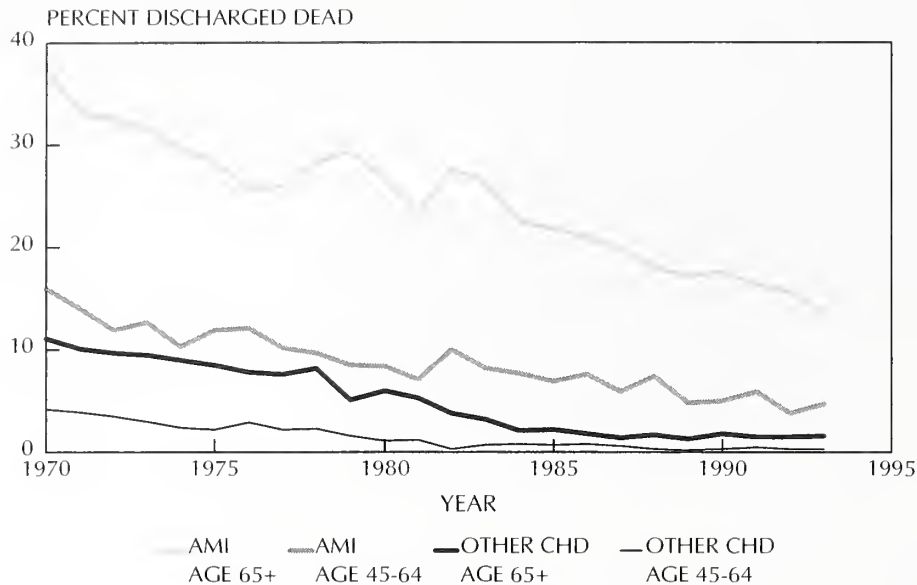
CHART 3-20
DEATH RATES FOR CHD,
ACTUAL AND EXPECTED, U.S., 1950-1994

AGE-ADJUSTED RATE/100,000 POPULATION

Peak minus actual rates results in 570,000 fewer deaths in 1994 than expected:
Actual: 487,000
Expected: 1,057,000

YEAR

ACTUAL RATE   RATE IF RISE CONTINUED   PEAK RATE

NOTE: Comparability ratio applied to rates for 1968-1978. Rate in 1994 is provisional.

CHD accounted for 487,000 deaths in 1994. It would have accounted for 1,057,000 if the rate had remained at its 1963 peak.[7,17,20]

Coronary Heart Disease

CHART 3-21
DEATH RATES FOR CHD
BY RACE AND SEX, U.S., 1950-1994

AGE-ADJUSTED RATE/100,000 POPULATION

WHITE ━ WHITE ━ BLACK ━ BLACK
MALE   FEMALE   MALE*   FEMALE*
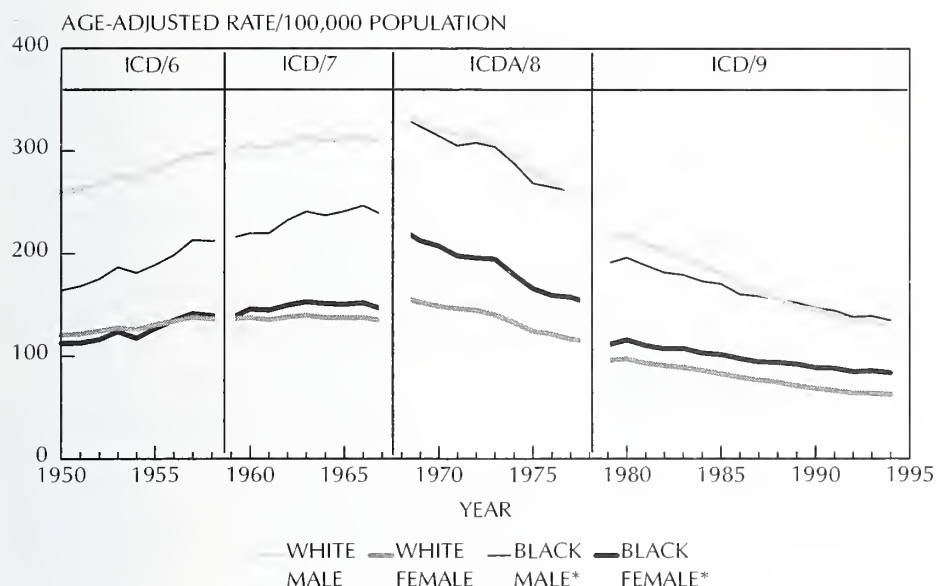
* Nonwhite from 1950 to 1967.
NOTE: Rates for 1994 are provisional.

CHD mortality since 1950 demonstrates a clear rise and fall for each race-sex group.[7,17,20]

Because rates of decline are steeper in white males than in black males, the death rate is higher in black males than in white males, and the gap is widening.

CHART 3-22
DEATHS AND DEATH RATES FOR CHD,
U.S., 1979-1995

DEATHS IN THOUSANDS (BARS)   RATE/100,000 POPULATION (LINES)
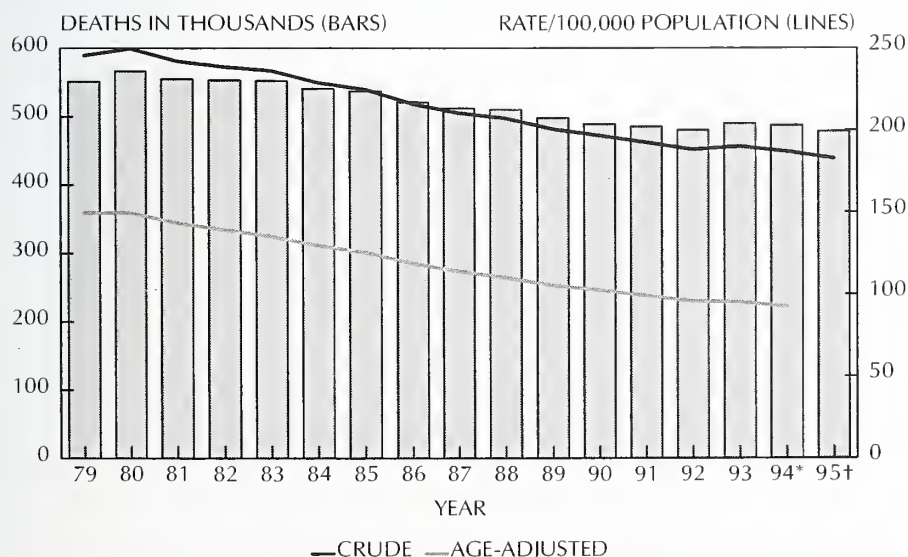
━ CRUDE ━ AGE-ADJUSTED

* Provisional.
† Twelve months ending June 1995.

The age-adjusted death rate for CHD continues to decline each year. Declines in the unadjusted death rate and in numbers of deaths continue but not every year.[3,7,21,34]

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Coronary Heart Disease

CHART 3-23
AVERAGE ANNUAL PERCENT DECLINE IN CHD AGE-ADJUSTED
DEATH RATES BY RACE AND SEX, SELECTED PERIODS,
U.S., 1970-1994

PERIOD	TOTAL POP.	WHITE MALE	WHITE FEMALE	BLACK MALE	BLACK FEMALE
1970-1978*	3.4	3.1	3.6	2.8	4.1
1980-1989	3.7	4.1	3.4	2.8	2.4
1990-1994	2.5	2.8	2.3	2.1	1.5

* Death rates for CHD beginning in 1979 are not comparable with rates for 1970-1978 due to ICD revision.

CHD mortality declines show the following:[7,20,21]

- In the 1980s and 1990s, white males and females experienced steeper declines than black males and females.

- Black females had the steepest rate of decline in the 1970s but the lowest rate of decline in the 1980s and 1990s.

- In contrast with the 1970s, males had a steeper rate of decline than females in the 1980s and 1990s.

CHART 3-24
AVERAGE ANNUAL PERCENT CHANGE IN DEATH RATES FOR CHD
BY AGE, RACE, AND SEX, U.S., 1989-1993

AVERAGE ANNUAL PERCENT CHANGE
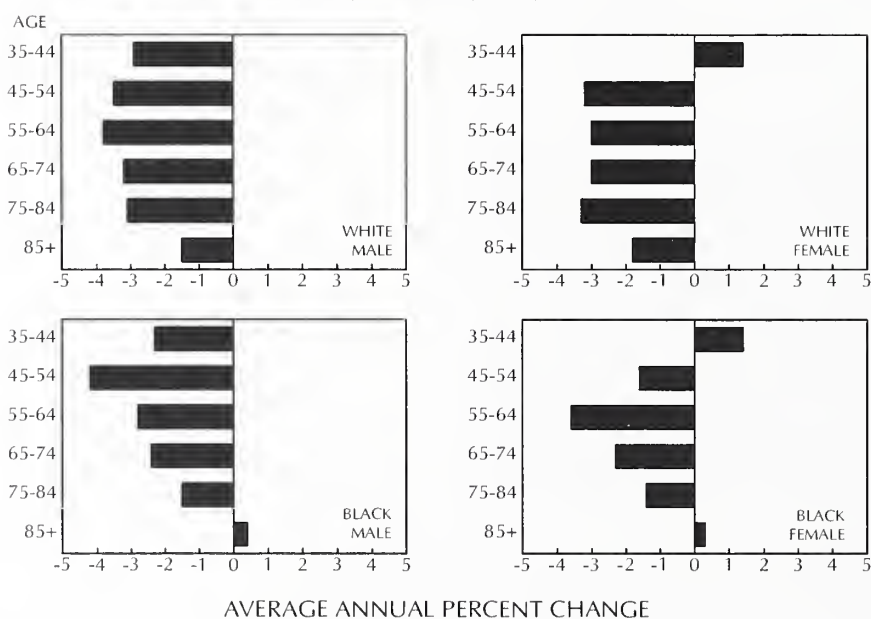
Declines in CHD mortality tend to be larger in younger age groups than in older age groups for each race-sex group.[7,17]

Coronary Heart Disease

CHART 3-25
DEATH RATES FOR CHD
BY RACE AND SEX, U.S., 1994

AGE-ADJUSTED RATE/100,000 POPULATION

■ TOTAL ☐ WHITE ▨ BLACK
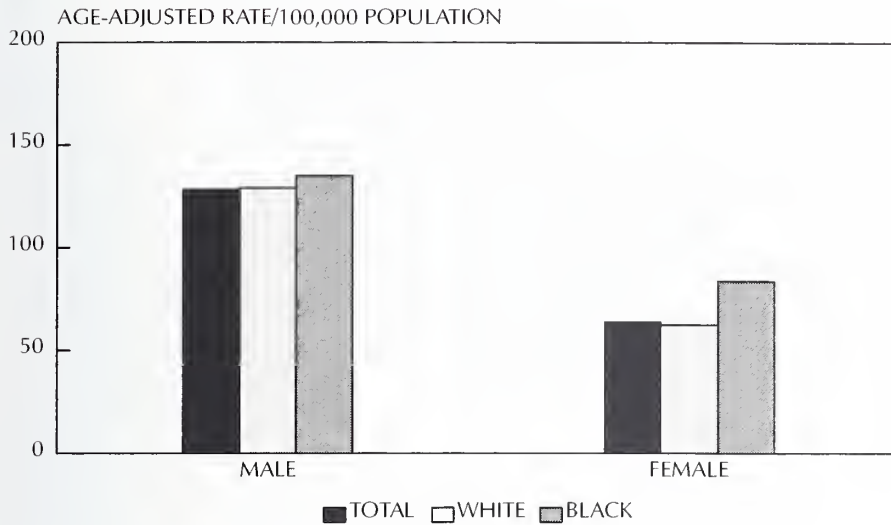
NOTE: Rates are provisional.

CHD mortality is:[17]

- **Higher in black males than in white males.**

- **Higher in black females than in white females.**

- **About twice as high in males as in females.**

CHART 3-26
DEATH RATES FOR CHD
BY AGE, RACE, AND SEX, U.S., 1993

RATE/100,000 POPULATION

WHITE   WHITE   BLACK   BLACK
MALE   FEMALE   MALE   FEMALE
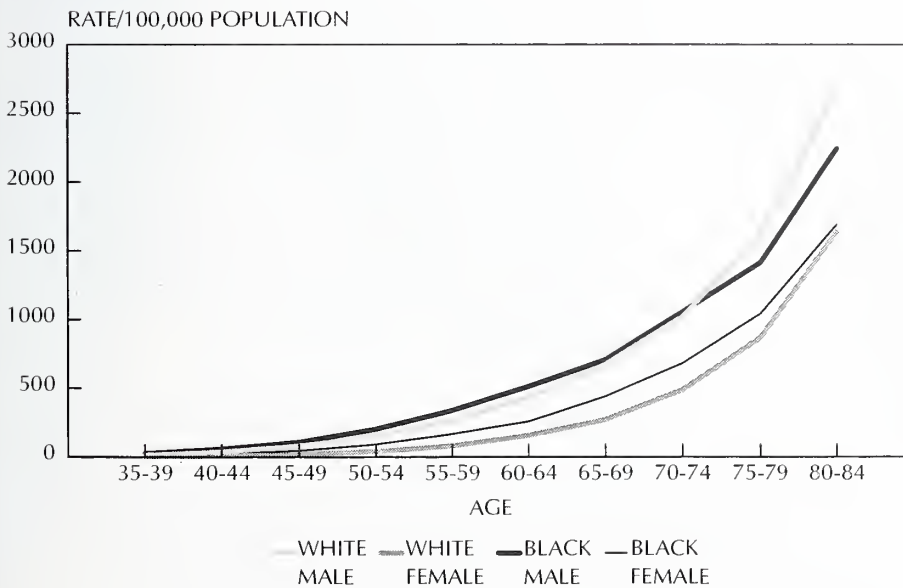
CHD mortality is:[17]

- **Higher in black males until age 70, after which rates are higher in white males.**

- **Higher in black females than in white females until age 85.**

- **Much higher in males than in females at each age.**

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Coronary Heart Disease

CHART 3-27
AGE-ADJUSTED DEATH RATES FOR CHD
BY STATE, U.S., 1989-1991

DEATHS/100,000 POPULATION
74 -97 98-110 111-124 125 -112
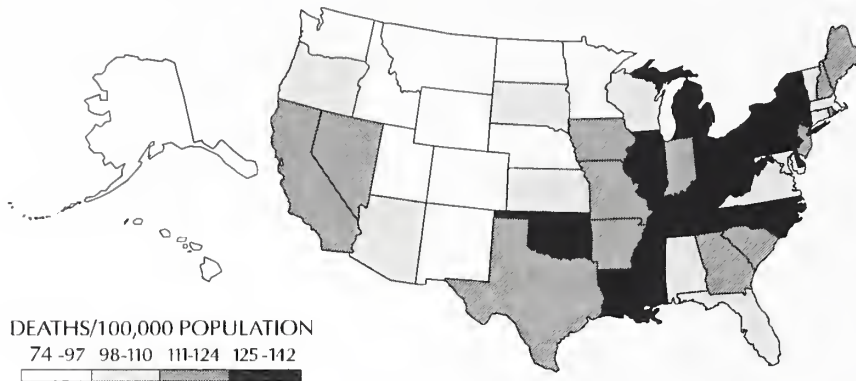
The death rates for CHD are highest in the Southeast, Northeast, and Appalachian areas.[7]

CHART 3-28
DEATH RATES FOR CHD
AGE 35-74, BY COUNTRY AND SEX, 1992

AGE-ADJUSTED RATE/100,000 POPULATION

FEMALE   MALE

400   200   0   200   400   600   800

* Eighth revision of the *International Classification of Diseases.*
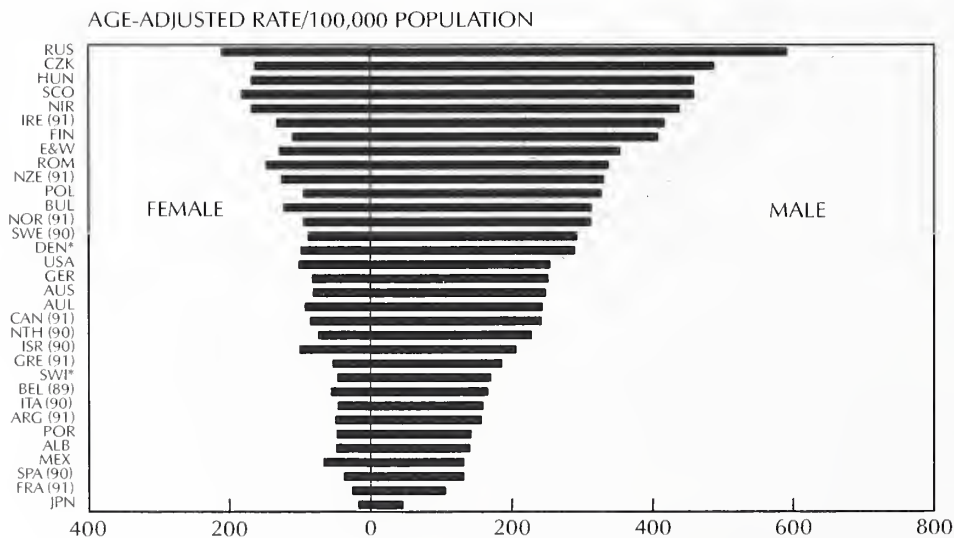
Among 33 industrialized countries, the United States ranks 16th for CHD mortality in men and 12th in women.[4]

The CHD death rate in U.S. men is twice that in Spain and five times that in Japan.

The CHD death rate in U.S. women is 2½ times that in Spain and six times that in Japan.

Coronary Heart Disease

CHART 3-29
PERCENT CHANGE IN DEATH RATES FOR CHD IN MEN AGE 35-74 BY COUNTRY, 1985-1992

AVERAGE ANNUAL PERCENT CHANGE
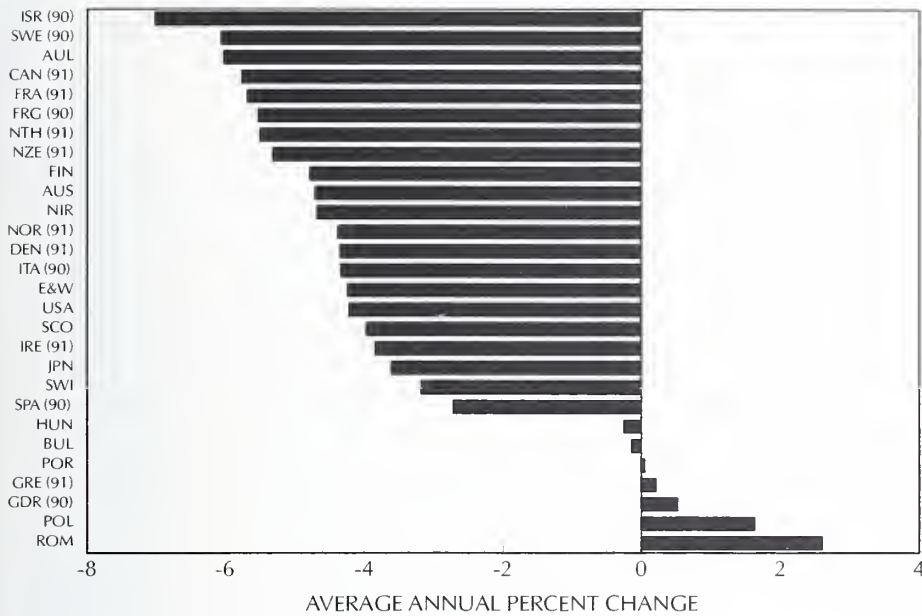
Fifteen countries have a greater decline in CHD mortality in men than the United States.[4]

CHART 3-30
PERCENT CHANGE IN DEATH RATES FOR CHD IN WOMEN AGE 35-74 BY COUNTRY, 1985-1992

AVERAGE ANNUAL PERCENT CHANGE
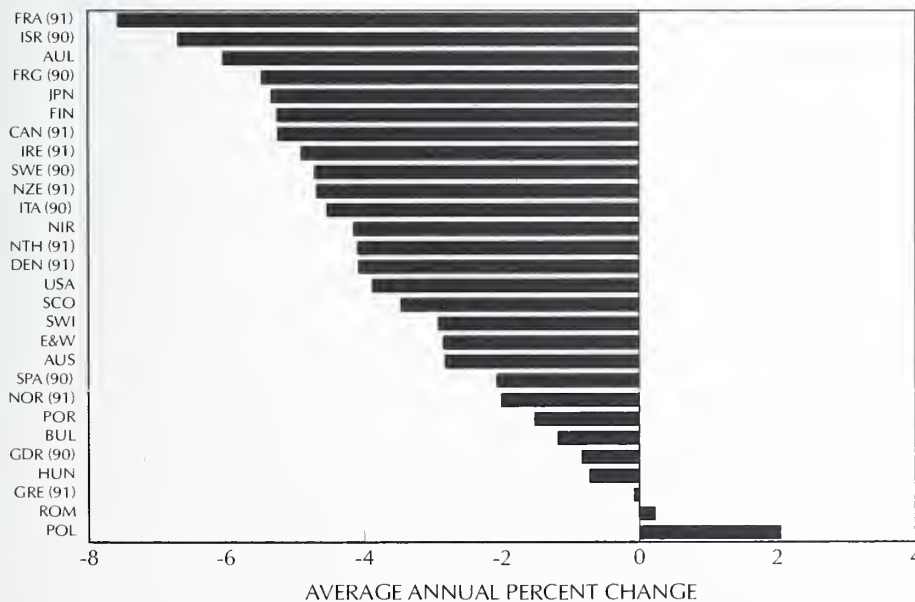
Fourteen countries have a much greater decline in CHD mortality in women than the United States.[4]

Congestive Heart Failure

CHART 3-31
PREVALENCE OF CHF FROM HEALTH INTERVIEWS:
WHITE MEN AND WOMEN, NHANES I, II, III

PERCENT PREVALENCE

AGE

1971-1975 ——1976-1980 ——1988-1991
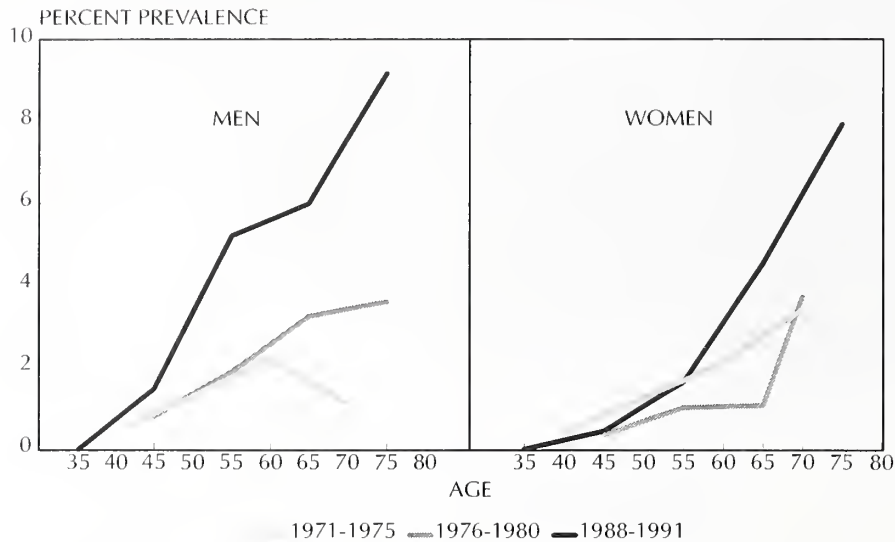
Source: National Health and Nutrition Examination Survey.

Prevalence of CHF is much higher at most ages in the 1988-1991 period than in earlier periods in men and women.[12,37,38]

CHART 3-32
HOSPITALIZATION RATES FOR HEART FAILURE,
AGE 45-64 AND 65+, U.S., 1971-1993

RATE/10,000 POPULATION

YEAR

——45-64 ——65+
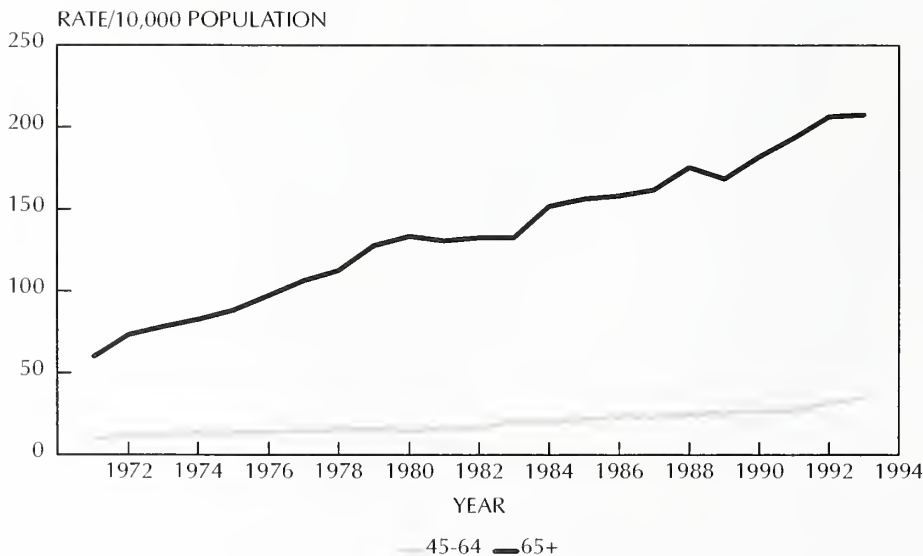
Rates of hospitalization for heart failure have been rising markedly.[26,36]

Congestive Heart Failure

CHART 3-33
HOSPITAL CASE-FATALITY RATE FOR CHF BY AGE,
U.S., 1981-1993

PERCENT DISCHARGED DEAD

YEAR

65+ ━━<65
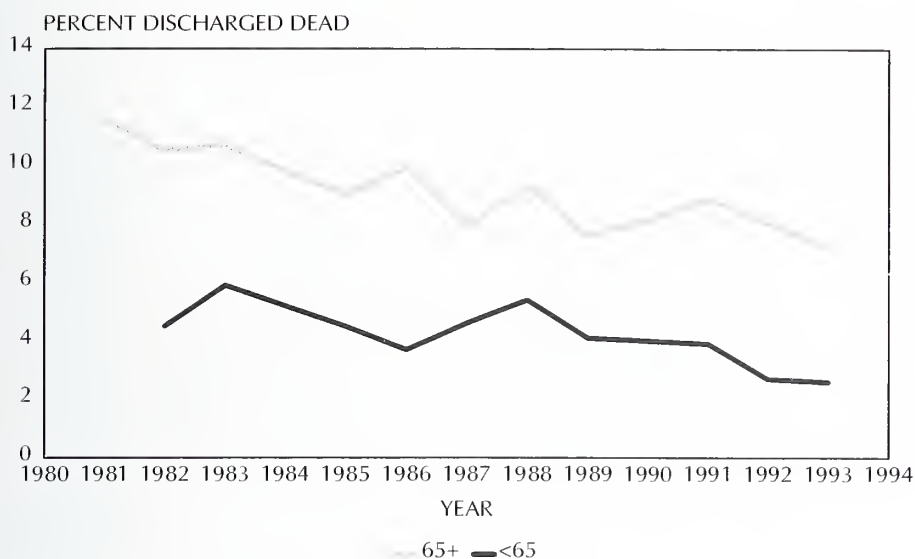
Source: National Hospital Discharge Survey.

The percent of hospital discharges for CHF that are discharged dead declined during the 1981-1993 period in ages younger and older than 65 years.[36]

CHART 3-34
DEATH RATES FOR HEART FAILURE
BY RACE AND SEX, U.S., 1968-1993

AGE-ADJUSTED RATE/100,000 POPULATION

ICD/8   ICD/9

YEAR

WHITE ━━WHITE ━━BLACK ━━BLACK
MALE   FEMALE   MALE   FEMALE

NOTE: The magnitude of mortality from heart failure was affected by revision of the ICD in 1979 and the introduction of cause-of-death coding instructions on death certificates in 1989.
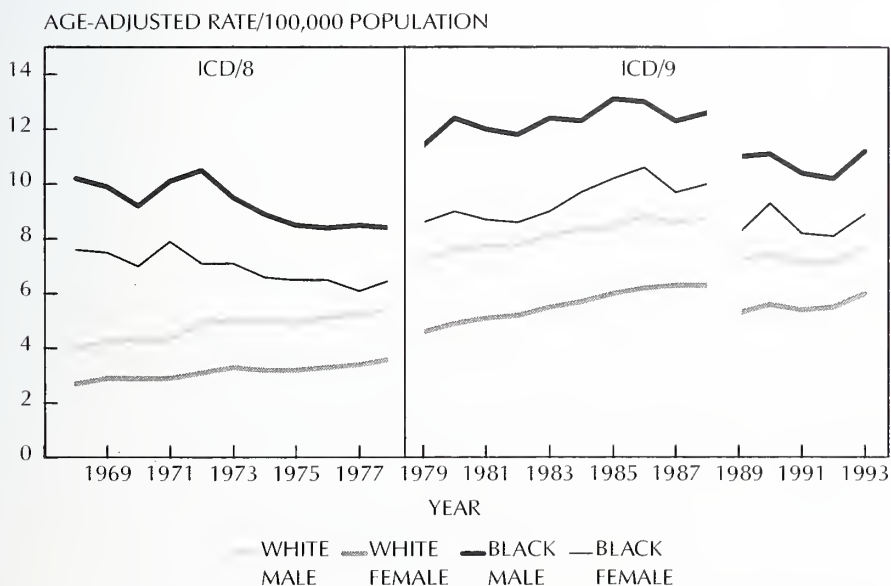
Increasing trends in death rates for heart failure, which began in 1968 for whites and in 1979 for blacks, have recently been modest.[7,17]

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Congestive Heart Failure

CHART 3-35
DEATH RATES FOR CONGESTIVE HEART FAILURE
BY RACE AND SEX, U.S., 1993

AGE-ADJUSTED RATE/100,000 POPULATION

TOTAL WHITE BLACK
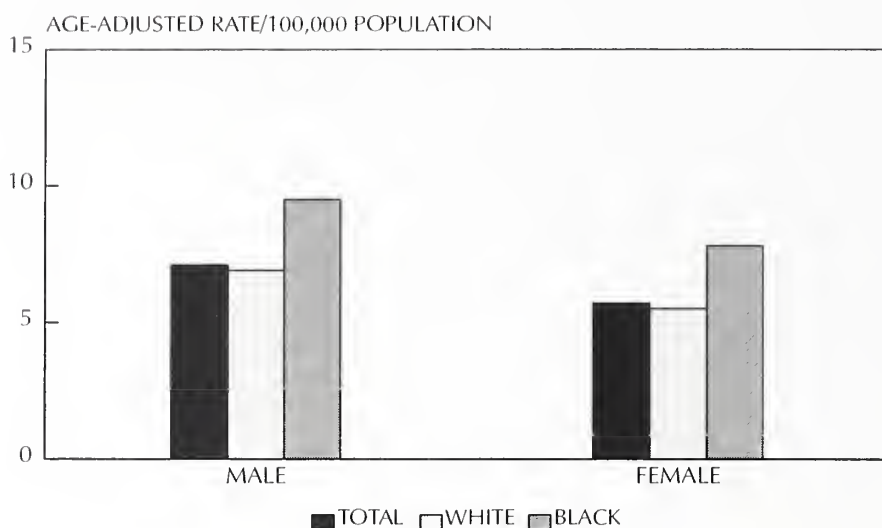
Congestive heart failure mortality is about 40 percent higher in blacks than in whites and is one-fourth higher in males than in females.[17]

CHART 3-36
DEATH RATES FOR CONGESTIVE HEART FAILURE
BY AGE, RACE, AND SEX, U.S., 1993

RATE/100,000 POPULATION

AGE

WHITE MALE WHITE FEMALE BLACK MALE BLACK FEMALE
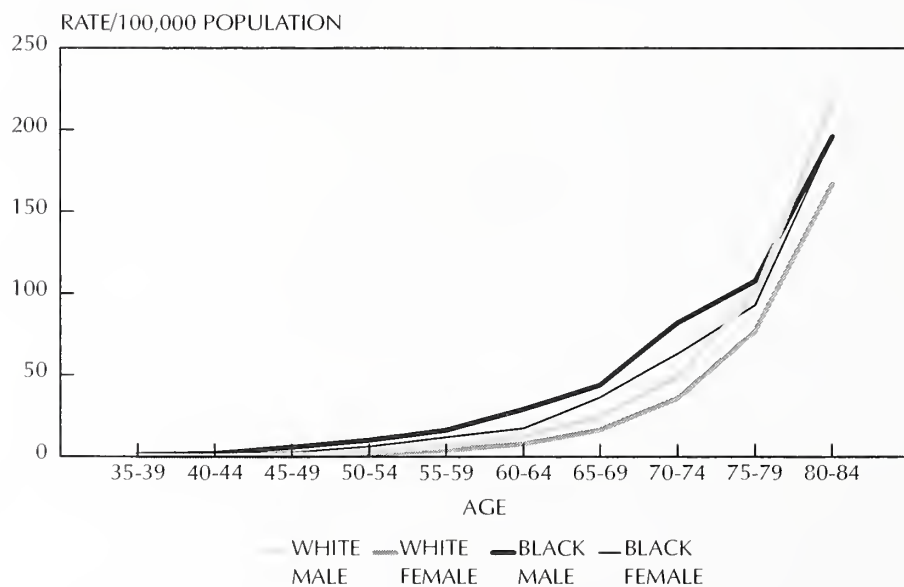
At younger adult ages, congestive heart failure mortality is much higher in blacks than in whites and higher in males than in females.[17]

Cardiomyopathy

CHART 3-37
DEATH RATES FOR CARDIOMYOPATHY
BY RACE AND SEX, U.S., 1992

AGE-ADJUSTED RATE/100,000 POPULATION

■TOTAL ☐WHITE ▨BLACK
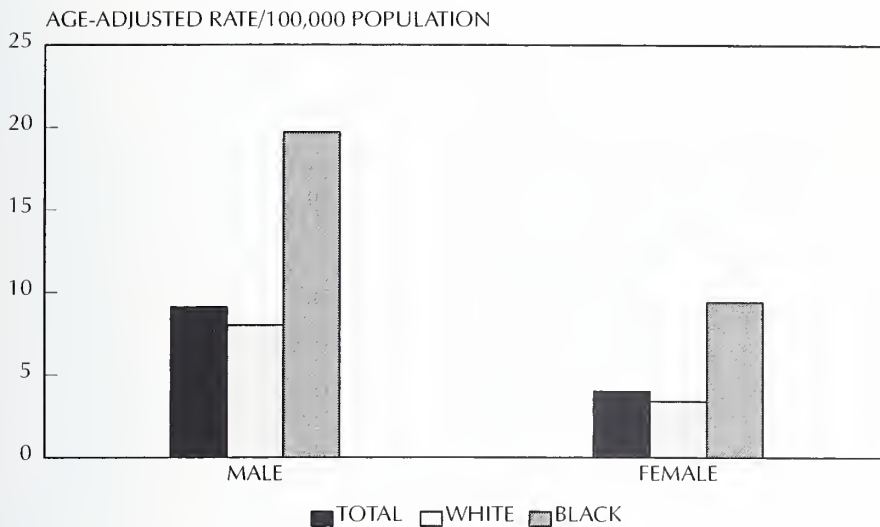
The age-adjusted death rate for cardiomyopathy is twice as high in blacks as in whites, and it is higher in males than females.[17]

CHART 3-38
DEATH RATES FOR CARDIOMYOPATHY
BY AGE, RACE, AND SEX, U.S., 1992

RATE/100,000 POPULATION

WHITE   WHITE   BLACK   BLACK
MALE   FEMALE   MALE   FEMALE
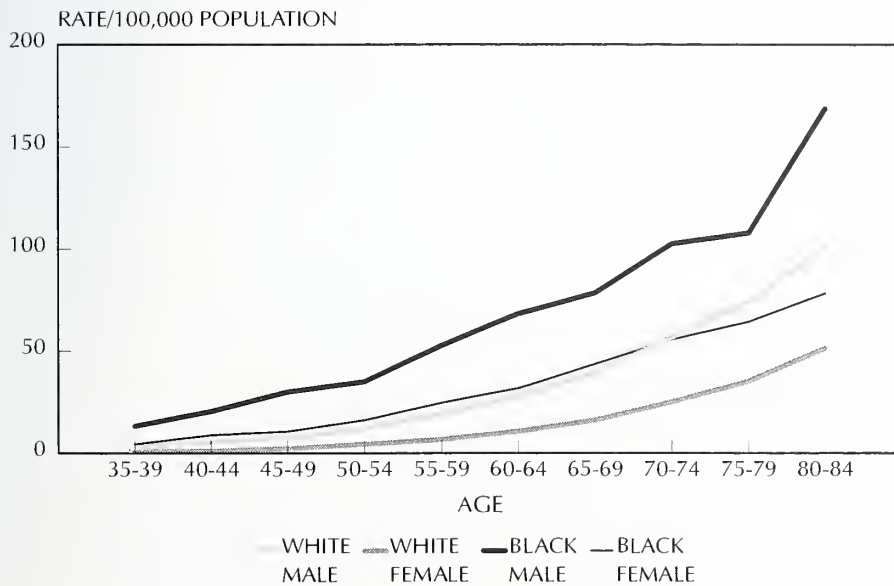
The black-white and male-female gaps in mortality from cardiomyopathy are large at each adult age group.[17]

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Cerebrovascular Diseases (Stroke)

CHART 3-39
PREVALENCE OF STROKE,
NHIS, U.S., 1972-1994

The prevalence of stroke continues to increase in most years from 1972 to 1994.[13,35]

PREVALENCE (MILLIONS)   PREVALENCE/1,000 POPULATION

YEAR

☐NUMBERS ▬RATE
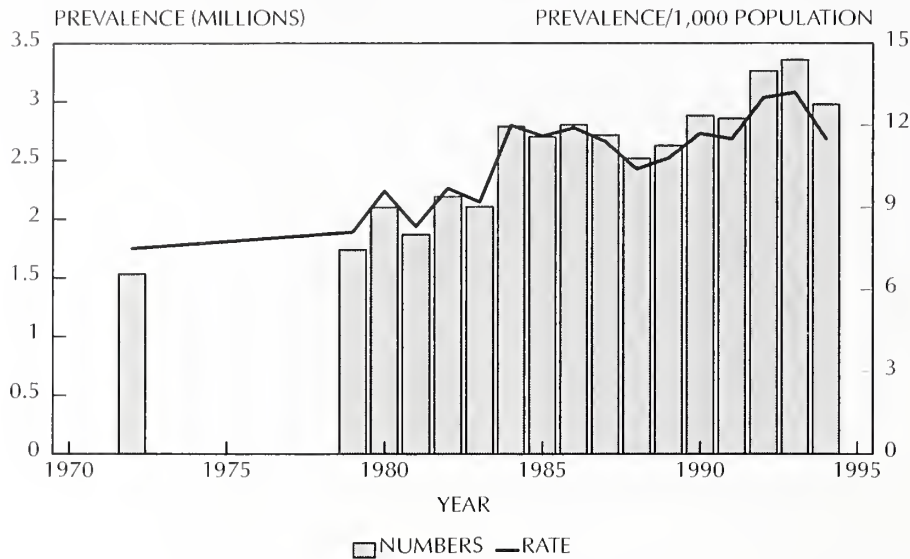
CHART 3-40
PREVALENCE OF STROKE BY AGE, NHIS, U.S., 1972-1994

Although most of the increase in the prevalence of stroke from 1972 to 1994 is in persons age 65 and older, the rate of increase is about the same in each age group.[13,35]

PREVALENCE/1,000 POPULATION

YEAR

▬ 65+ ▬<65
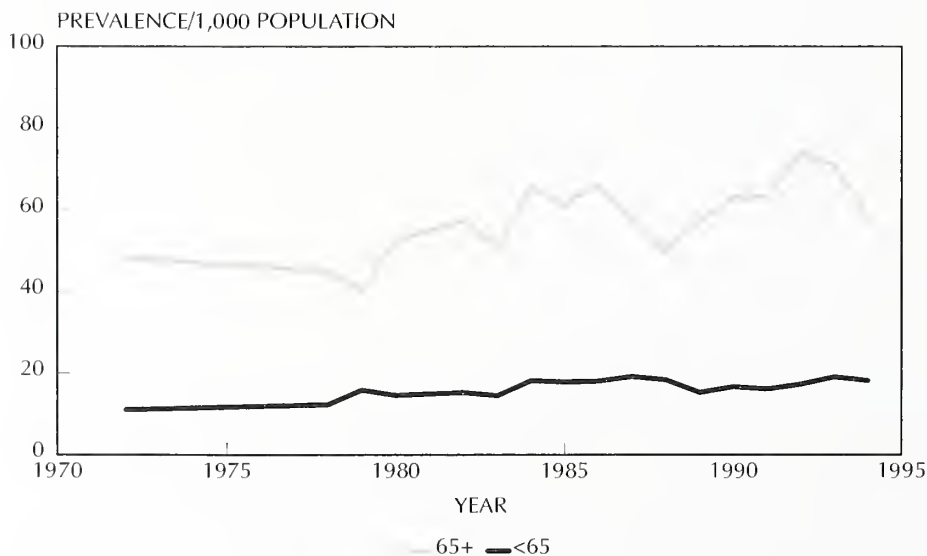
Cerebrovascular Diseases (Stroke)

CHART 3-41
PREVALENCE OF STROKE FROM HEALTH INTERVIEWS:
WHITE MEN AND WOMEN, NHANES II AND III

PERCENT PREVALENCE

MEN

WOMEN

AGE

1976-1980 ━━1988-1991

Age- and sex-specific prevalence rates for stroke show only a modest increase for women from the 1976-1980 period to the 1988-1991 period.[12,38]

CHART 3-42
HOSPITALIZATION RATES FOR STROKE,
AGE 45-64 AND 65+, U.S., 1971-1993

RATE/10,000 POPULATION

YEAR

━ 45-64 ━━65+
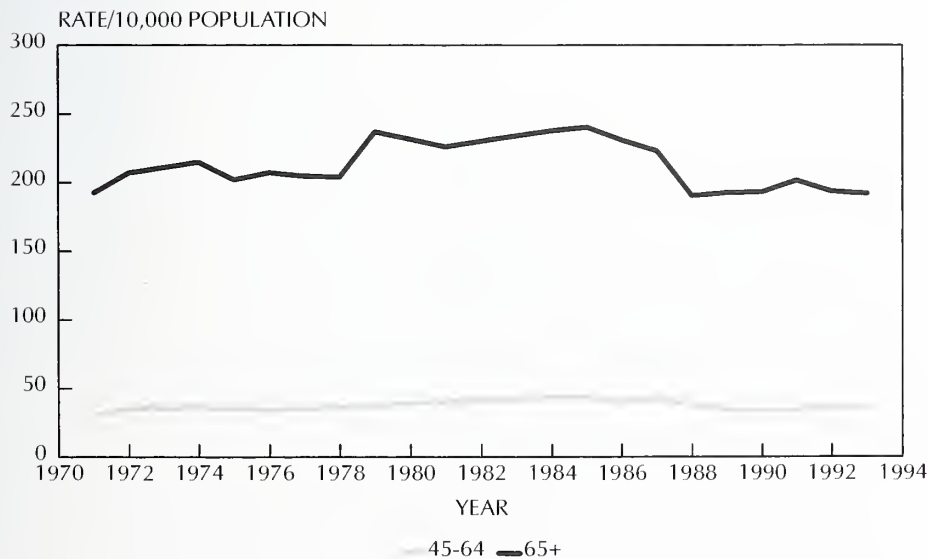
Until recent years, hospitalization rates for stroke were modestly increasing.[26,36]

Cerebrovascular Diseases (Stroke)

CHART 3-43
DEATH RATES FOR STROKE
BY RACE AND SEX, U.S., 1950-1994

AGE-ADJUSTED RATE/100,000 POPULATION

YEAR

WHITE ━━WHITE ━━BLACK ━BLACK
MALE FEMALE MALE* FEMALE*
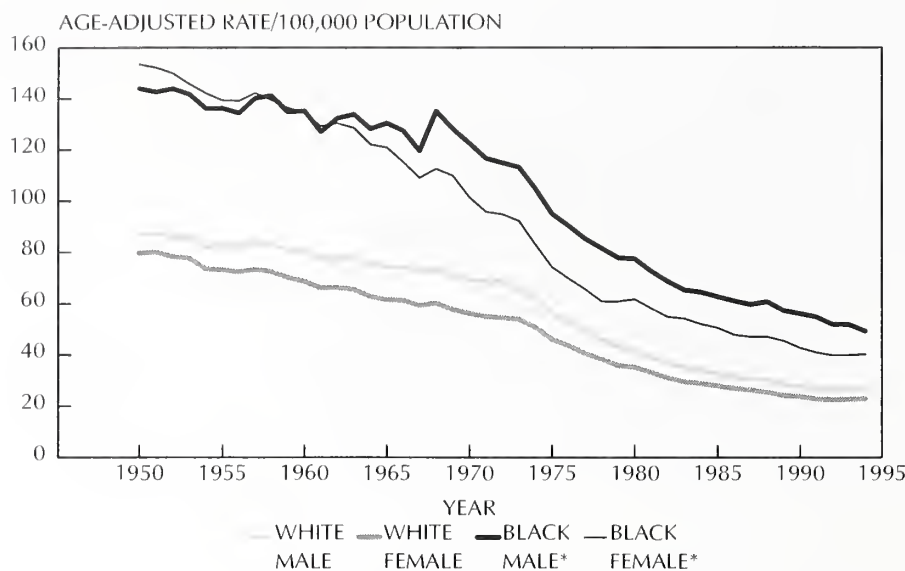
* Nonwhite from 1950 to 1967.
NOTE: Rates for 1994 are provisional.

Following the steady and steep downward slopes in stroke mortality in the 1970s for white and black males and females, the declines slowed in the 1980s. In white males and females and black females, there was an upturn in 1993 and 1994.[7,20]

CHART 3-44
DEATHS AND DEATH RATES FOR STROKE,
U.S., 1979-1995

DEATHS IN THOUSANDS (BARS)   RATE/100,000 POPULATION (LINES)

YEAR

━CRUDE ━━AGE-ADJUSTED
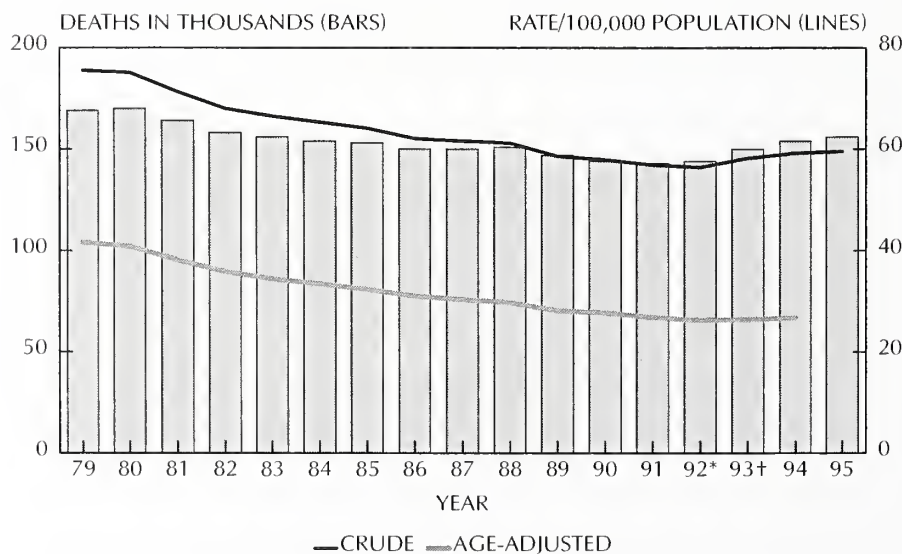
* Provisional.
† Twelve months ending June 1995.

Beginning in 1992, deaths from stroke increased each year. The crude death rates for stroke increased in 1993, 1994, and the first half of 1995.[3,7,21,34]

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Cerebrovascular Diseases (Stroke)

CHART 3-45
DEATH RATES FOR STROKE BY ETHNICITY, RACE, AND SEX,
U.S., 1980-1992

RATE/100,000 POPULATION

MALE   FEMALE

YEAR

BLACK ━━WHITE ━━HISPANIC ━━ASIAN
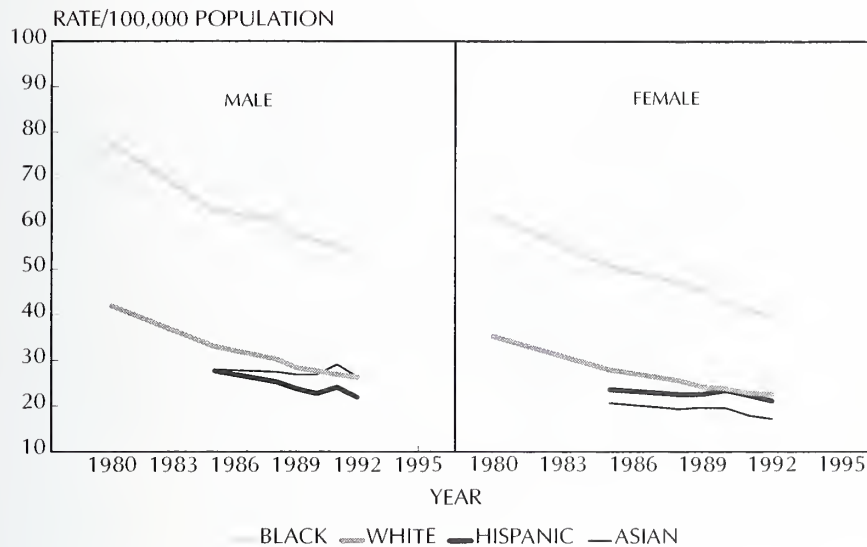
NOTE: Rates are age-adjusted.

The death rate for stroke
declined appreciably
between 1980 and 1992 for
whites and blacks. Rates
declined only recently in
Asians and irregularly in the
Hispanic populations.[24]

CHART 3-46
AVERAGE ANNUAL PERCENT CHANGE IN STROKE
AGE-ADJUSTED DEATH RATES BY RACE AND SEX, SELECTED PERIODS,
U.S., 1970-1994

PERIOD	TOTAL POPULATION	WHITE MALE	WHITE FEMALE	BLACK MALE	BLACK FEMALE
1970-1975	-3.8	-3.6	-3.5	-4.5	-5.6
1975-1980	-5.6	-6.2	-5.5	-4.2	-5.2
1980-1985	-4.4	-4.6	-4.5	-4.1	-3.8
1985-1990	-3.1	-3.3	-3.2	-2.1	-2.8
1990-1994	-0.8	-0.5	-0.8	-3.1	-1.4

NOTE: Death rates for 1994 are provisional.

The steep declines in stroke
mortality in the 1970s and
1980s, seen in men, women,
whites, and blacks, were
followed by very modest
declines between 1990 and
1994.[7,17]

Cerebrovascular Diseases (Stroke)

CHART 3-47
DEATH RATES FOR STROKE
BY RACE AND SEX, U.S., 1994

AGE-ADJUSTED RATE/100,000 POPULATION
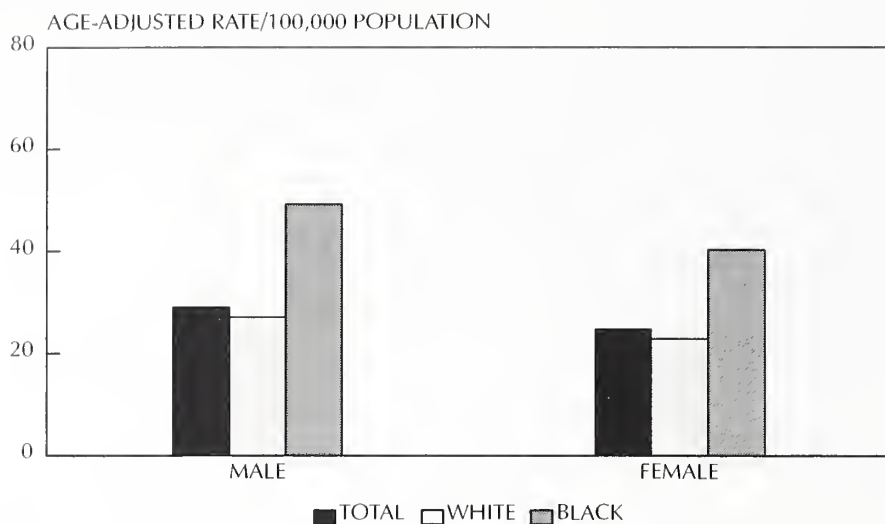
NOTE: Rates are provisional.

Age-adjusted stroke mortality is:[17]

- **Almost twice as high in blacks as in whites.**

- **Approximately 17 percent higher in males than in females.**

CHART 3-48
DEATH RATES FOR STROKE
BY AGE, RACE, AND SEX, U.S., 1993

RATE/100,000 POPULATION
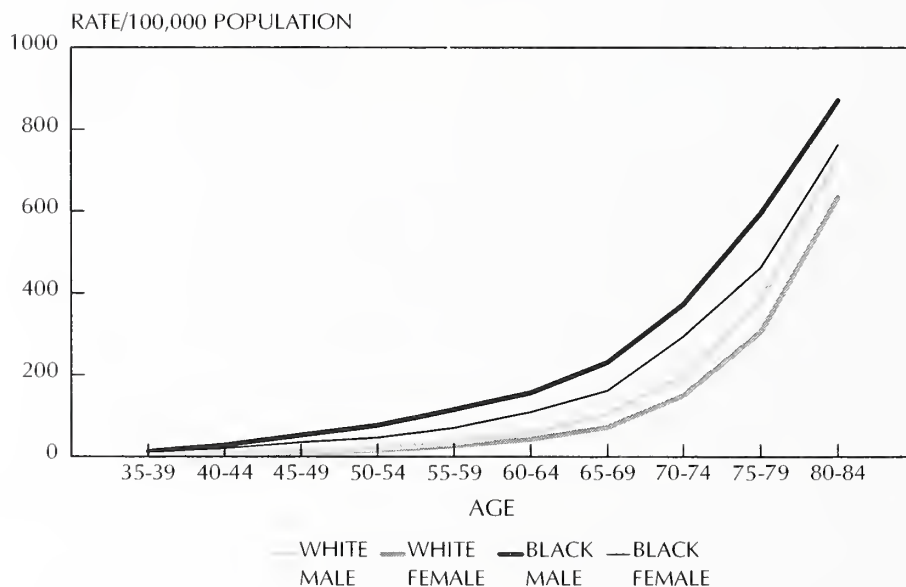
Age-specific stroke mortality is:[17]

- **Higher in blacks than whites in all age groups up to age 84.**

- **Higher in males than in females throughout all adult age groups.**

Cerebrovascular Diseases (Stroke)

CHART 3-49
AGE-ADJUSTED DEATH RATES FOR STROKE
BY STATE, U.S., 1989-1991

DEATHS/100,000 POPULATION
21 - 24   25-26   26-29   29-42
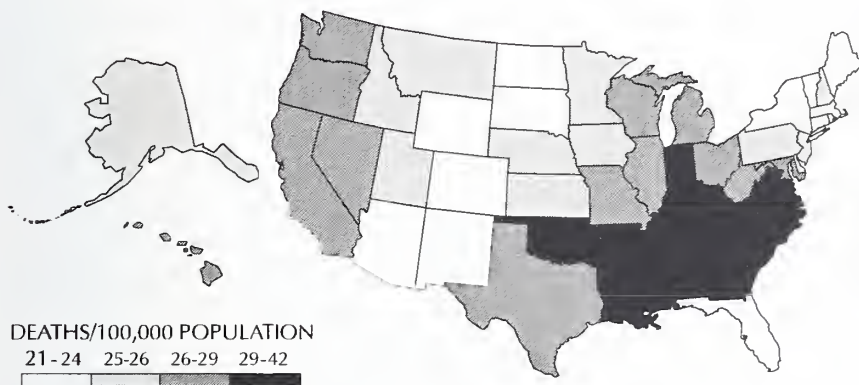
Death rates for stroke are the highest in the southeastern states, most of which comprise "the Stroke Belt."[7]

CHART 3-50
DEATH RATES FOR STROKE
AGE 35-74, BY COUNTRY AND SEX, 1992

AGE-ADJUSTED RATE/100,000 POPULATION

FEMALE   MALE

200   100   0   100   200   300
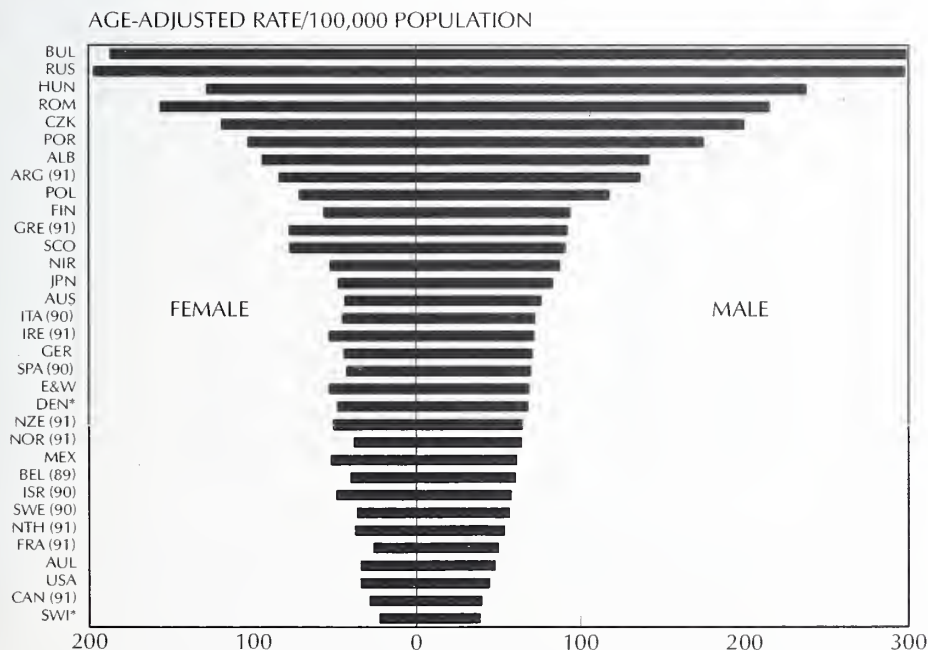
Among 33 industrial countries, the United States has one of the lowest death rates for stroke.[4] Eastern European countries and Portugal have markedly higher rates compared with other countries.

* Eighth revision of the ICD.

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Cerebrovascular Diseases (Stroke)

CHART 3-51
PERCENT CHANGE IN DEATH RATES FOR STROKE IN MEN AGE 35-74 BY COUNTRY, 1985-1992

AVERAGE ANNUAL PERCENT CHANGE
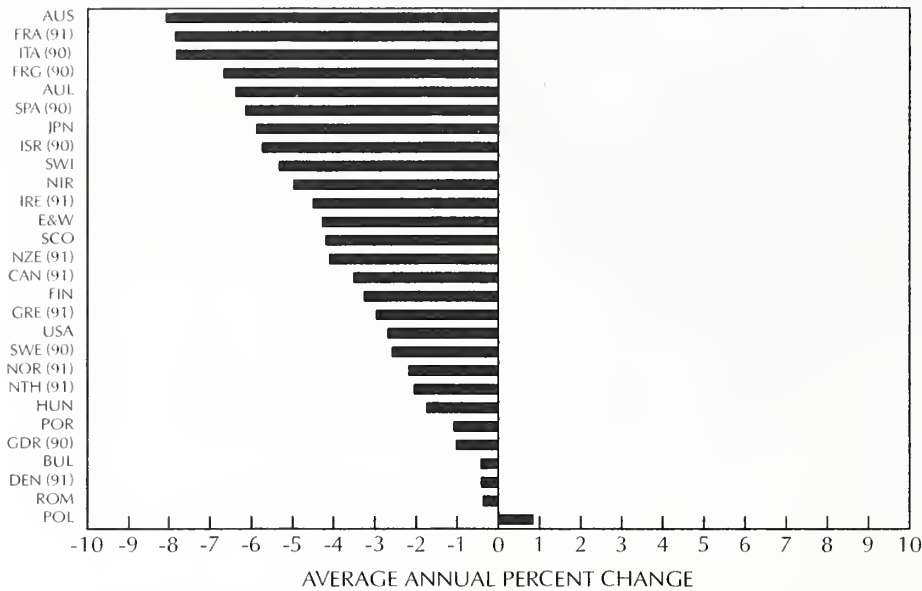
Seventeen countries have greater percent declines in stroke mortality in men than the United States in the 1985-1992 period.[4]

CHART 3-52
PERCENT CHANGE IN DEATH RATES FOR STROKE IN WOMEN AGE 35-74 BY COUNTRY, 1985-1992

AVERAGE ANNUAL PERCENT CHANGE
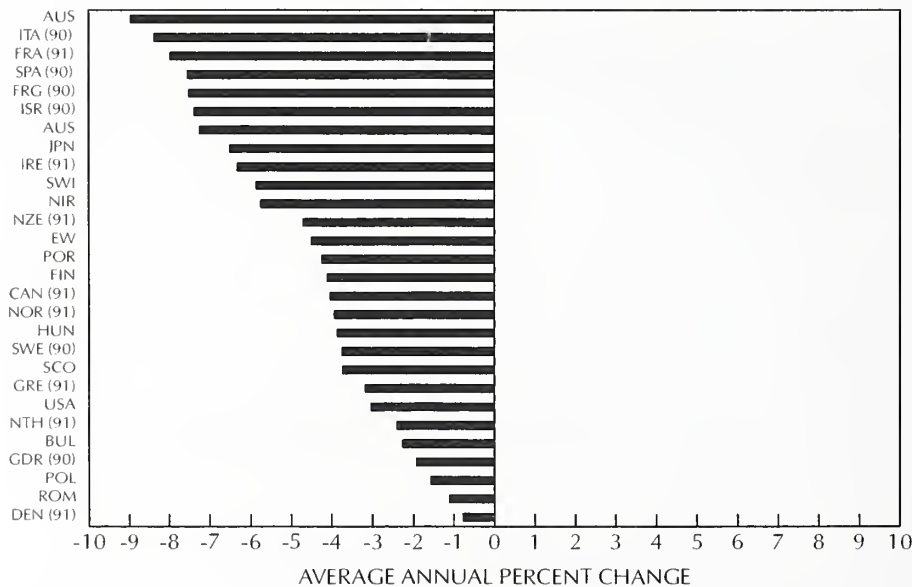
Twenty-one countries have greater percent declines in stroke mortality in women than the United States in the 1985-1992 period.[4]

Hypertension
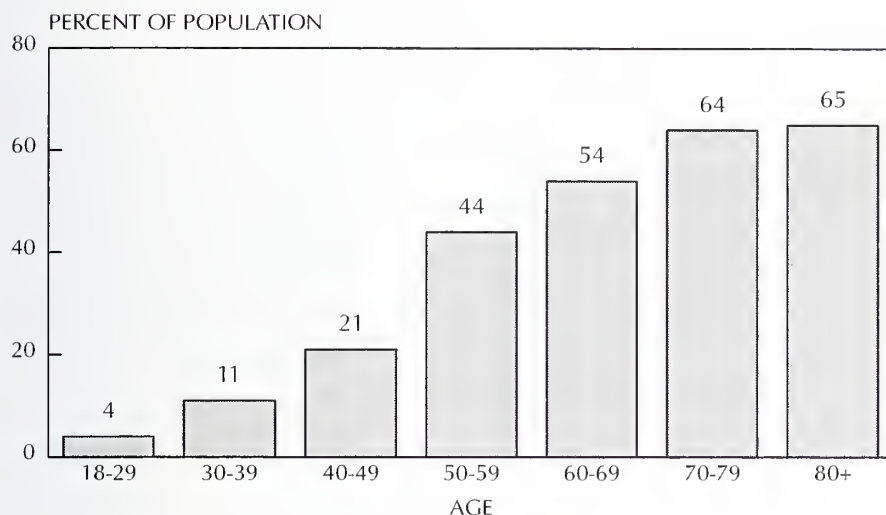
PERCENT OF POPULATION

AGE

* Systolic blood pressure 140+ mmHg, or 90+ diastolic blood pressure, or on medication.

Percent prevalence of hypertension is 44 percent at age 50-59, and two-thirds of the population older than age 70 have hypertension.[39]

CHART 3-54
PERCENT PREVALENCE OF HYPERTENSION*
BY SEX AND RACE-ETHNICITY, AGE 65-74, U.S., 1988-1991
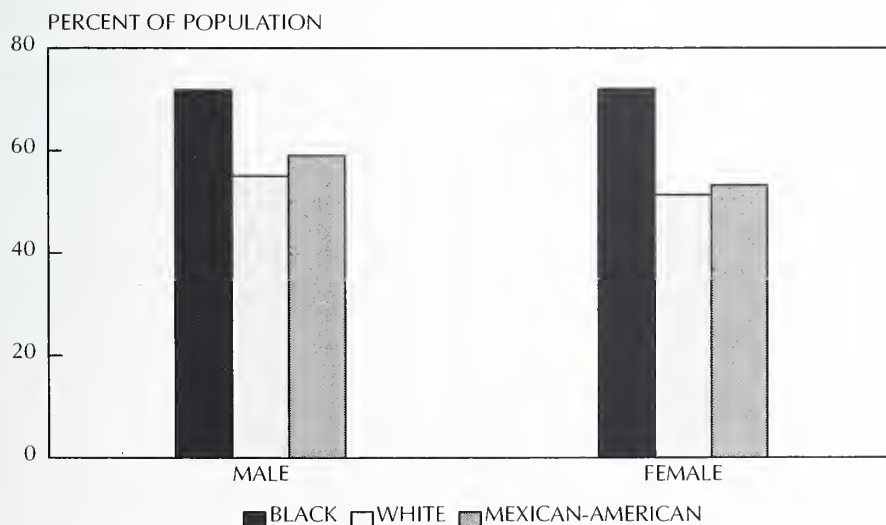
PERCENT OF POPULATION

MALE FEMALE

■BLACK □WHITE ▨MEXICAN-AMERICAN

* Systolic blood pressure 140+ mmHg, or 90+ diastolic blood pressure, or on medication.

Percent prevalence of hypertension is appreciably higher in blacks than whites, seen here for age 65-74.[40] In that age group, percent prevalence is about the same in whites and Mexican-Americans.

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Hypertension

CHART 3-55
PERCENT OF THE HYPERTENSIVE POPULATION AWARE, TREATED, AND CONTROLLED, U.S., 1971-1972 TO 1988-1991

PERCENT OF HYPERTENSIVE POPULATION*

| | UNAWARE | ON MED CNTL | ON MED UNCNTL | NO MED UNCNTL |
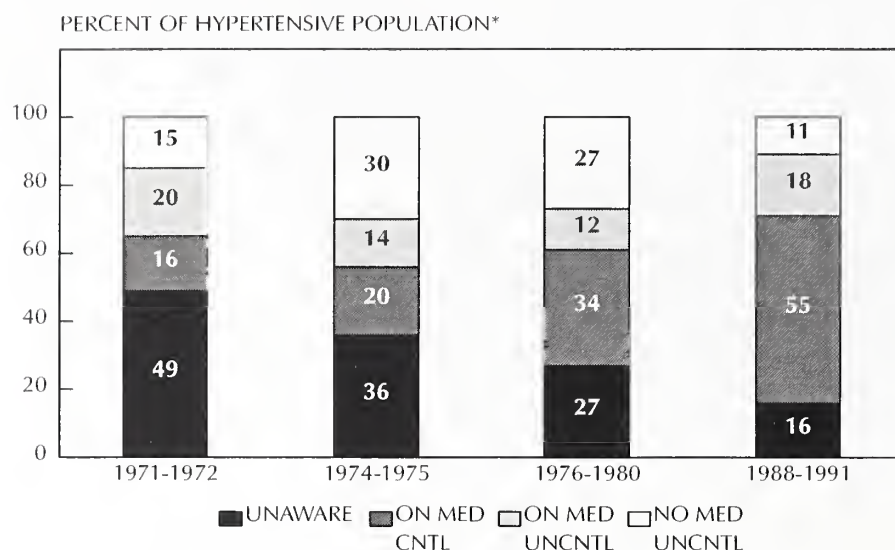
* Systolic blood pressure 160+ mmHg, or diastolic blood pressure 95+, or taking antihypertensive medication.
NOTE: MED = medication, CNTL = controlled, UNCNTL = uncontrolled.

In 1971-1972, 51 percent of persons with a high level of hypertension (160/95 mmHg or greater or on antihypertensive medication) were aware of their condition.[9,41] By 1988-1991, 84 percent of persons with a high level of hypertension were aware of it. The percent of persons treated and controlled increased from 16 percent in 1971-1972 to 55 percent in 1988-1991.

CHART 3-56
PERCENT HYPERTENSION AWARENESS, TREATMENT, AND CONTROL, U.S., 1976-1980 AND 1988-1991*

1976-1980

1988-1991
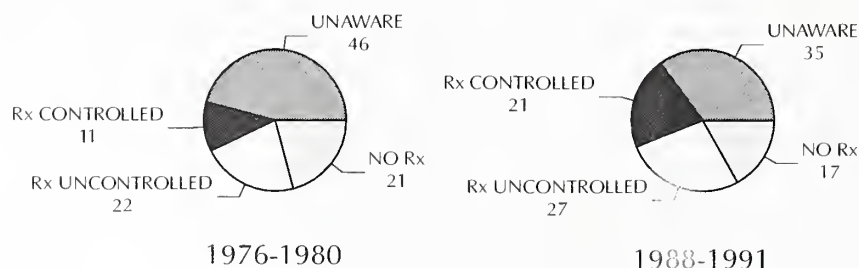
* Systolic blood pressure 140+ mmHg, or 90+ diastolic, or on medication.
NOTE: RX = medication.

When hypertension is defined as blood pressure of 140/90 mmHg or greater or on antihypertensive medication, 65 percent of hypertensive persons were aware of it in 1988-1991; 48 percent were on treatment for it; and 21 percent were treated and had it controlled.[9,41] Those percentages were appreciably greater than the comparable figures for the 1976-1980 period.

Diseases of Arteries

AGE-ADJUSTED RATE/100,000 POPULATION

TOTAL WHITE BLACK
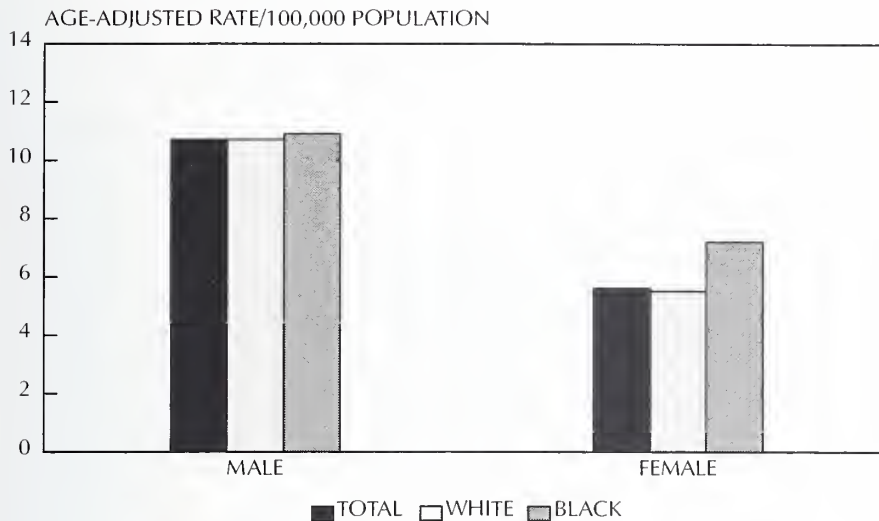
Age-adjusted death rates for diseases of arteries are:[17]

- Higher in males than in females.

- About the same in blacks as whites.

RATE/100,000 POPULATION

WHITE   WHITE   BLACK   BLACK
MALE   FEMALE   MALE   FEMALE

AGE
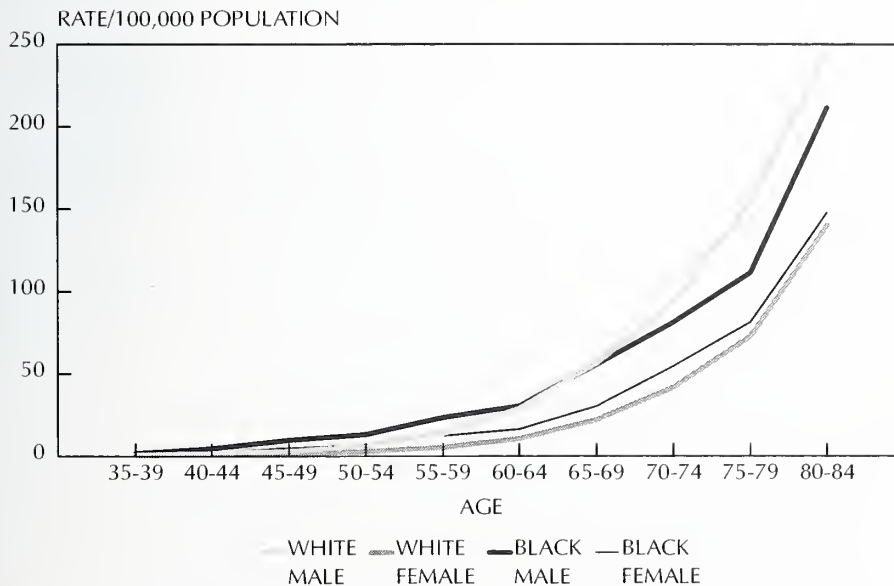
Age-specific death rates for diseases of arteries are:[17]

- Higher in males than females in all age groups.

- Higher in black females than white females in all age groups.

- Higher in black males than white males younger than age 65; higher in white males than black males older than age 65.

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Congenital Anomalies of the Circulatory System

CHART 3-59
DEATHS FROM CONGENITAL HEART DISEASE,
PERCENTAGE BEFORE AGE 1, U.S., 1940-1993

AGE-ADJUSTED RATE/100,000 POPULATION

YEAR
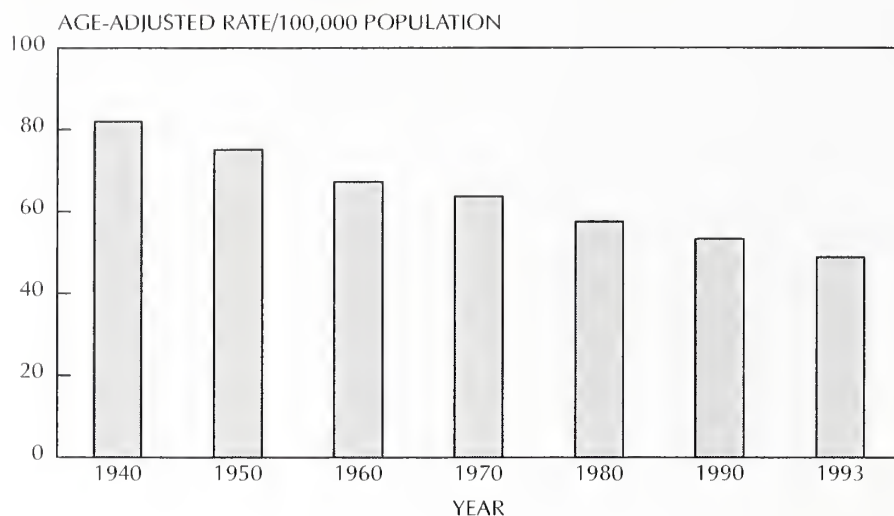
The percentage of deaths from congenital anomalies of the circulatory system occurring at younger than age 1 declined from 82 in 1940 to 49 in 1993.[7]

CHART 3-60
INFANT MORTALITY FROM CONGENITAL HEART DISEASE
BY RACE, U.S., 1968-1993

DEATHS/100,000 LIVE BIRTHS

YEAR

HEART: ▬HEART: ▬OTHER CV: ▬OTHER CV:
WHITE   BLACK*   WHITE   BLACK*
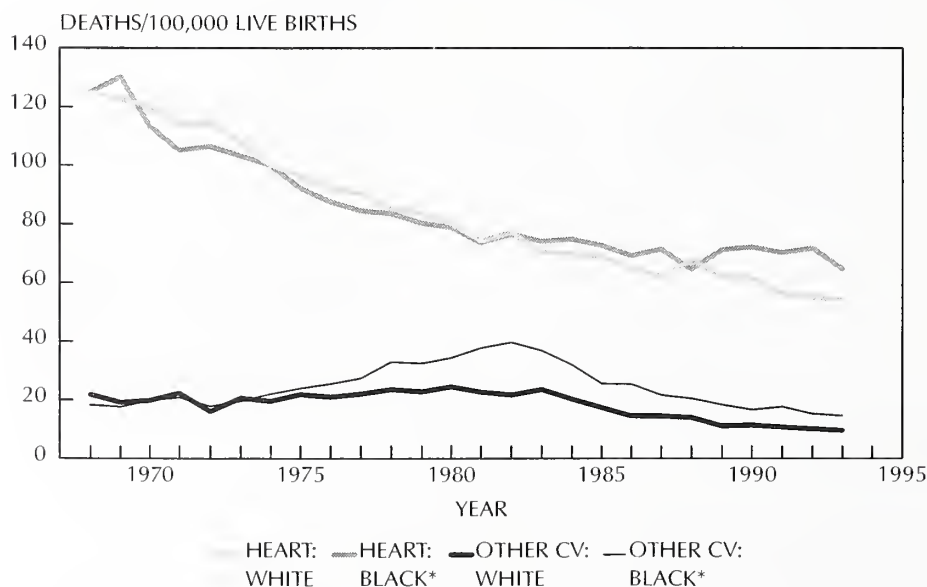
* Rates before 1979 are for nonwhites.

Congenital heart disease mortality declined in the 1970s and 1980s.[7]

For other congenital anomalies of the circulatory system, the trend is downwards only since the early 1980s. The black-white gap is narrowing.

Atrial Fibrillation

CHART 3-61
HOSPITAL DISCHARGES FOR ATRIAL FIBRILLATION, U.S., 1982-1993

DISCHARGES (THOUSANDS)

YEAR

■ FIRST-LISTED □ SECONDARY
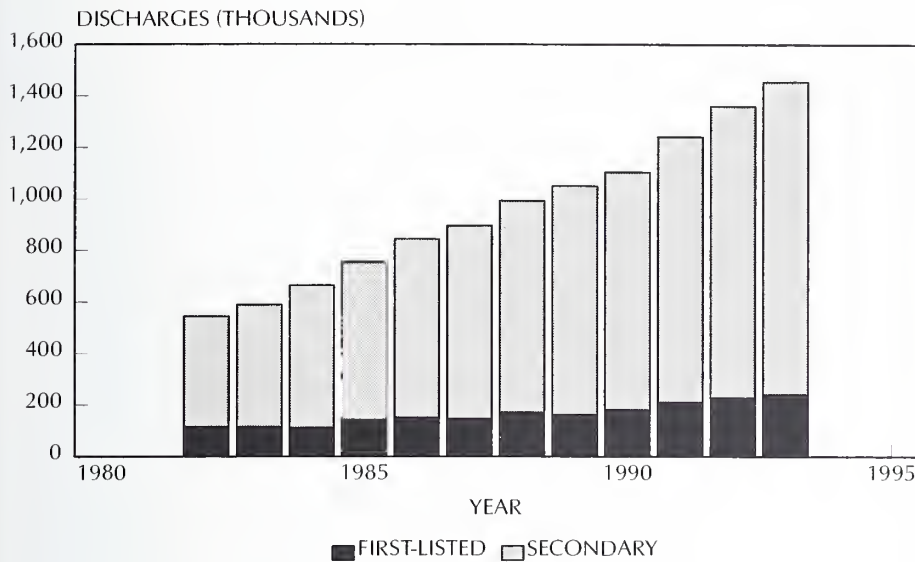
The number of hospital discharges for atrial fibrillation as the first-listed diagnosis and as a secondary diagnosis increased rather steadily from 1982 to 1993.[26,36]

CHART 3-62
HOSPITAL DISCHARGE RATES FOR ATRIAL FIBRILLATION BY AGE, U.S., 1979-1993

DISCHARGE/10,000 POPULATION

YEAR

45-64 ▬▬ 65+
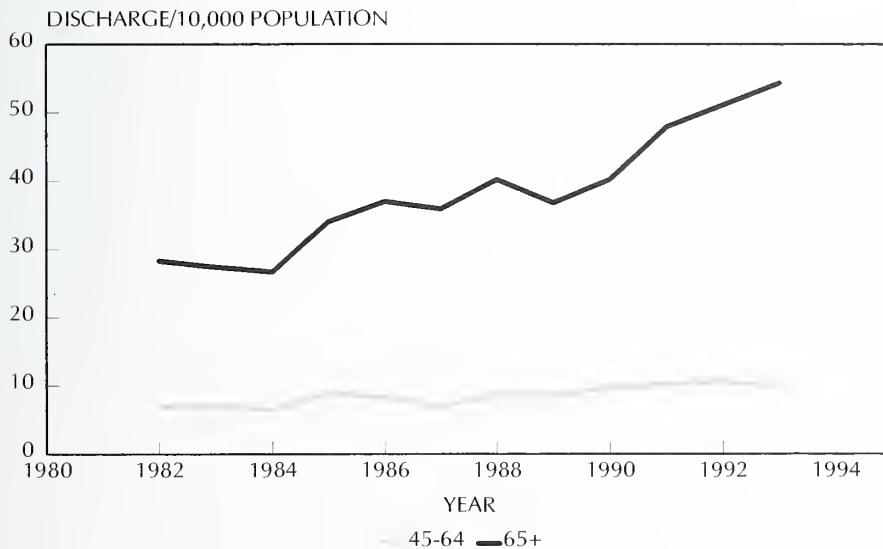
NOTE: ICD code is 427.31.

Although the increase in the rate of hospital discharges for atrial fibrillation from 1979 to 1993 was substantial at age 65 and older and modest for age 45-64, the rate of increase was similar in each age group.[26,36]

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4. Lung Diseases

The diagnostic group "Lung Diseases" is used in this chartbook to mean selected lung diseases, not all of which are in the ICD chapter on "Diseases of the Respiratory System." Lung cancer, hay fever, the common cold, and pulmonary heart disease are common diseases that are not included. The main focus is on COPD and asthma. The first table in this section gives a relatively detailed listing of the selected lung diseases and appropriate ninth revision ICD codes. The terminology used is modified from the exact ICD terminology. The table gives estimates of hospital discharges, lengths of stay, physician office visits, and deaths for 1993 for these diagnostic groups. The fourth leading cause of death is COPD and allied conditions (ICD/9 codes 490-496). This category contains almost 102,000 deaths in 1993 and comprises the following: emphysema (17 percent), chronic bronchitis (3.5 percent), asthma (5.6 percent), bronchiectasis, extrinsic allergic alveolitis, and the generalized category—chronic airways obstruction (73.9 percent) (refer to pie chart opposite).

Chronic Obstructive Pulmonary Disease

For purposes of this chartbook, COPD mortality comprises the entire category, excluding asthma (codes 490-492, 494-496), assuming deaths from bronchiectasis and extrinsic allergic alveolitis are too few to affect the total. Hospitalization and physician office visit statistics for COPD are also classified in this manner. For prevalence, however, COPD comprises only emphysema and chronic bronchitis; there is no generalized term. In the eighth revision of the *International Classification of Diseases* (1968 to 1978), as adapted for use in the United States (ICDA/8), a special code, "chronic obstructive lung disease" (519.3), was introduced because increasingly death certifiers had been entering generalized terms for COPD in place of the more specific terms: emphysema and chronic bronchitis. Otherwise, the effects of the ICD revisions on COPD mortality and morbidity are not large.

Asthma

The ninth revision of the *International Classification of Diseases* may have a profound effect on the asthma mortality time trend. Asthma mortality declined between 1968 and 1978 but has been increasing at least up to 1993, the turnaround coinciding with the recent ICD revision. It is not clear if the recent increase in asthma mortality is real or an artifact of the ICD coding change.

CHART 4-1
COPD AND ALLIED CONDITIONS DEATHS, PERCENT BY SUBGROUP, U.S., 1994

EMPHYSEMA 17.0%
CHRONIC BRONCHITIS 3.5%
ASTHMA 5.6%
CHRONIC AIRWAYS OBSTRUCTION 73.9%

Total Deaths = 101,870 (100%).
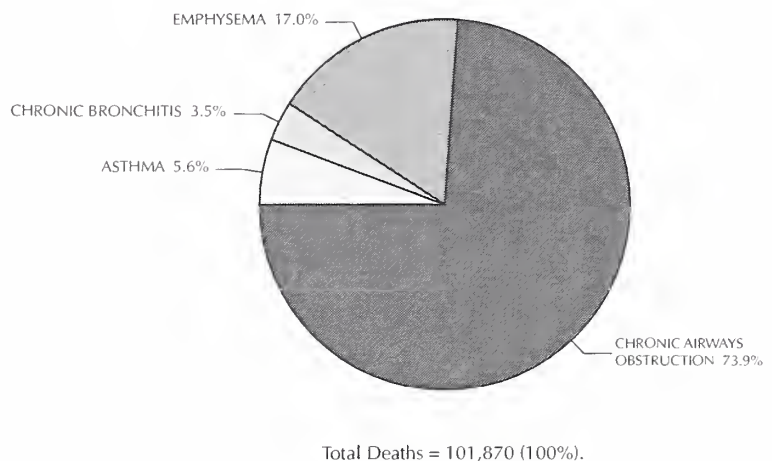
Lung Diseases

CHART 4-2
NUMBER OF HOSPITALIZATIONS, PHYSICIAN OFFICE VISITS, AND DEATHS
FOR SELECTED LUNG DISEASES IN THE U.S., 1993

DIAGNOSTIC CATEGORY	ICD/9 CODES	HOSPITALIZATIONS FIRST-LISTED DISCHARGE (000)	LENGTH OF STAY (DAYS)	PHYSICIAN OFFICE VISITS (000)	DEATHS
Chronic obstructive pulmonary disease (COPD)	490-492, 494-496	505	6.9	14,258	95,910
Bronchitis, not specified as acute or chronic	490	29	4.5	5,742	676
Chronic bronchitis	491	236	7.1	484	3,101
Emphysema	492	37	8.1	494	17,586
Chronic airways obstruction, NEC*	494-496	203	6.7	3,187	74,547
Asthma	493	468	4.4	11,340	5,167
Acute bronchitis and bronchiolitis	466	257	4.5	3,198	662
ARDS and respiratory failure	518.5, 518.8	132	12.0	155	5,511
Pulmonary edema	518.4	15	5.0	0	167
Cystic fibrosis	277.0	8	14.5	143	405
Pneumonia and influenza	480-487	1,209	7.7	6,736	82,820
Interstitial lung disorders					
Chronic interstitial pneumonia	515	17	7.7	213	6,379
Granulomatosis, sarcoidosis	135, 446.4	7	6.4	246	845
Tuberculosis	011, 012	16	16.5	87	1,276
Neonatal pulmonary disorders					
Respiratory distress syndrome	769	10	25.8	34	1,815
Immaturity, unqualified	765	35	21.9	98	4,310
Other neonatal pulmonary disorders	770	19	9.7	5	2,221

* Includes bronchiectasis (494) and extrinsic allergic alveolitis (495), which are not common. NEC = not elsewhere classified.
NOTE: Estimates of hospitalizations and physician office visits are subject to sampling variability. Estimates of hospitalizations below 50,000 have a relative standard error of more than 11 percent. Estimates of physician office visits below 588,000 have a relative standard error of more than 30 percent.
Compiled from references 17, 26, 27.
ARDS = Adult respiratory distress syndrome.

Lung Diseases

CHART 4-3
DEATH RATES FOR TOTAL LUNG DISEASES
BY RACE AND SEX, U.S., 1992

AGE-ADJUSTED RATE/100,000 POPULATION

■TOTAL ▫WHITE ▨BLACK
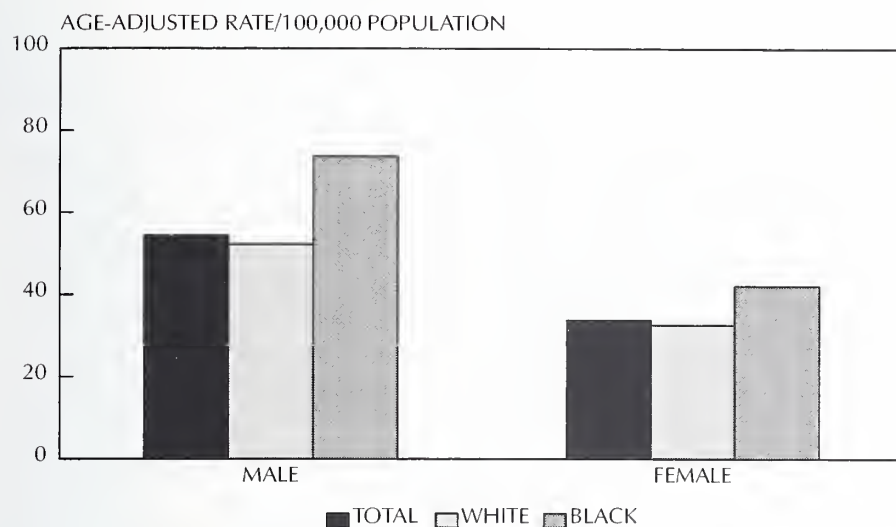
Age-adjusted death rates for lung diseases (other than lung cancer) are appreciably higher in blacks than whites and in males than females.[17]

CHART 4-4
DEATH RATES FOR TOTAL LUNG DISEASES
BY AGE, RACE, AND SEX, U.S., 1992

RATE/100,000 POPULATION

— WHITE MALE ▬WHITE FEMALE ▬BLACK MALE — BLACK FEMALE
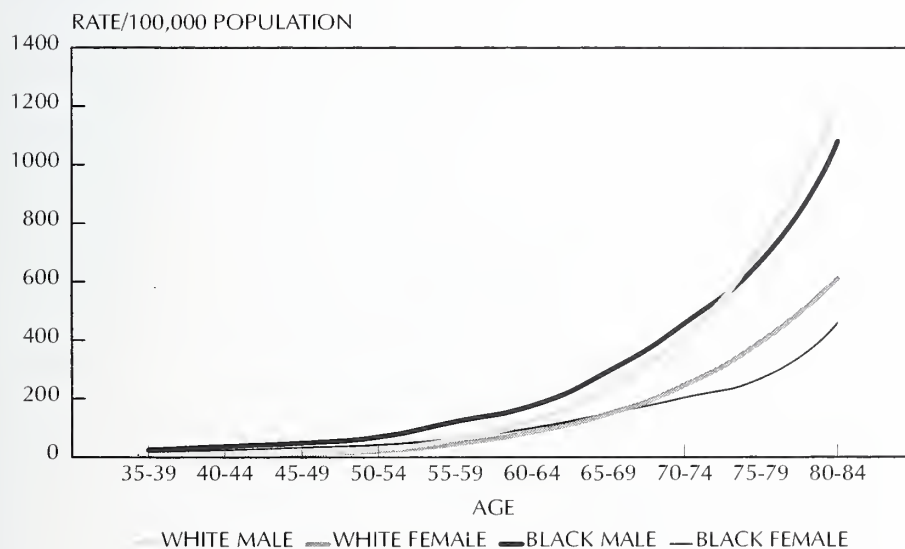
The black-white and male-female gap in mortality from total lung diseases are larger at each adult age group.[17]

NOTE: Includes tuberculosis, sarcoidosis, cystic fibrosis, acute bronchitis, influenza, pneumonia, COPD, asthma, interstitial lung disorders, ARDS, pulmonary edema, and pulmonary heart disease.

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Chronic Obstructive Pulmonary Disease

CHART 4-5
PREVALENCE OF CHRONIC BRONCHITIS, NHIS, U.S., 1970-1994

PREVALENCE (MILLIONS)

■ UNDER 18   ▨ 18-44   □ 45 AND OLDER
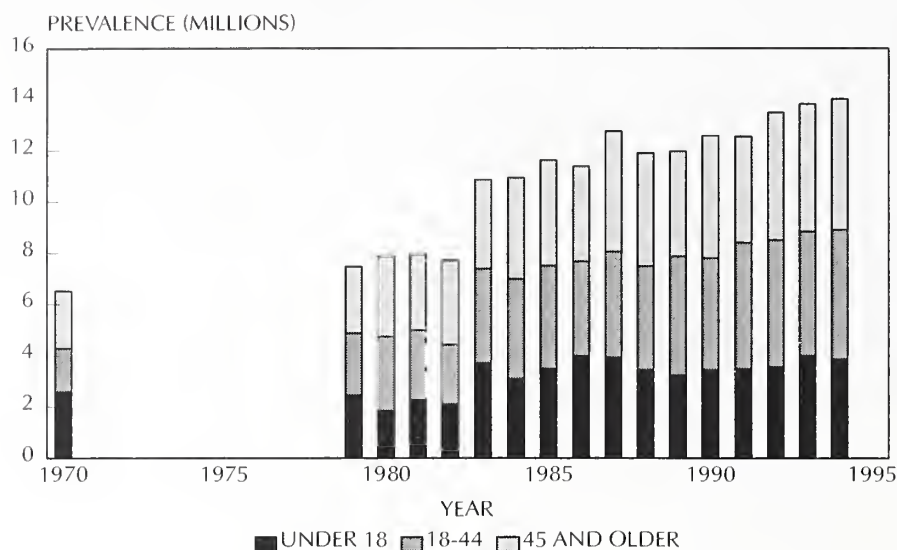
Total prevalence of chronic bronchitis increased relatively steadily between 1979 and 1994, reaching 14 million persons in 1994. Most of the increase is among persons age 18 and older.[13,35,42]

CHART 4-6
PREVALENCE OF EMPHYSEMA BY AGE, NHIS, U.S., 1982-1994

PREVALENCE/1,000 POPULATION

━ 65-74   ━ 45-64
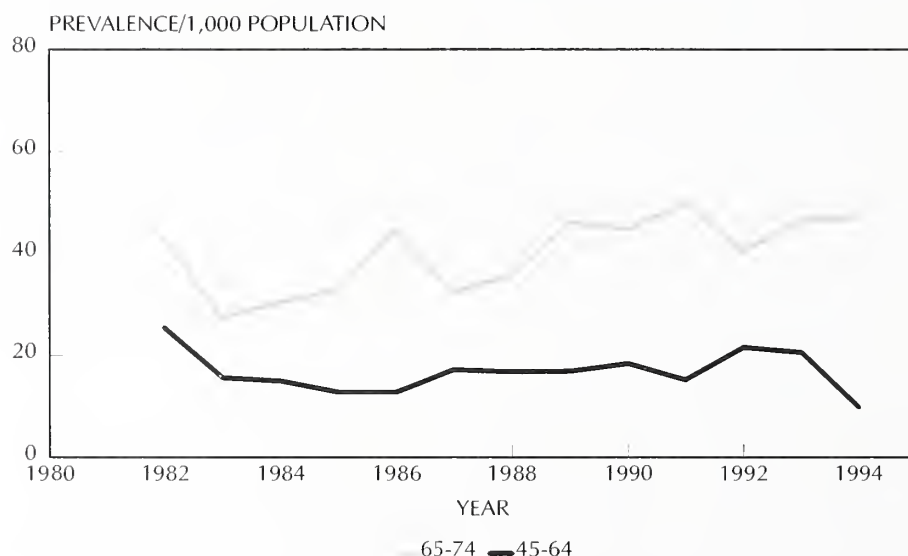
The prevalence of emphysema at age 65-74 is increasing, but prevalence at age 45-64 is not.[13,35]

Chronic Obstructive Pulmonary Disease

**CHART 4-7
HOSPITALIZATION RATES FOR COPD,
AGE 45-64 AND 65+, U.S., 1970-1993**

RATE/10,000 POPULATION

YEAR

—— 45-64 ——65+
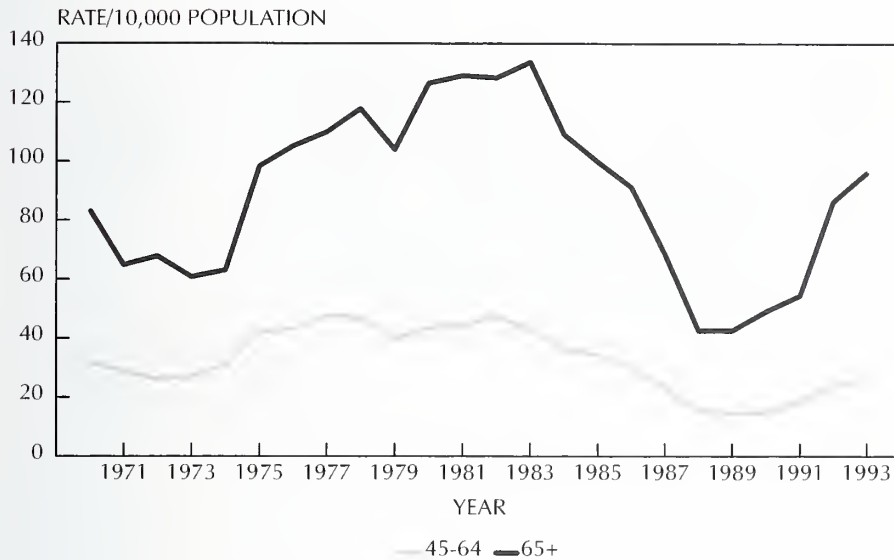
Large swings in trends in COPD hospitalizations occurred between 1970 and 1992 at age 45-64 and 65 and older.[26,36]

**CHART 4-8
DEATH RATES FOR COPD
BY RACE AND SEX, U.S., 1960-1993**

AGE-ADJUSTED RATE/100,000 POPULATION

YEAR

WHITE WHITE BLACK BLACK
MALE   FEMALE MALE* FEMALE*

* Nonwhite from 1960 to 1967.
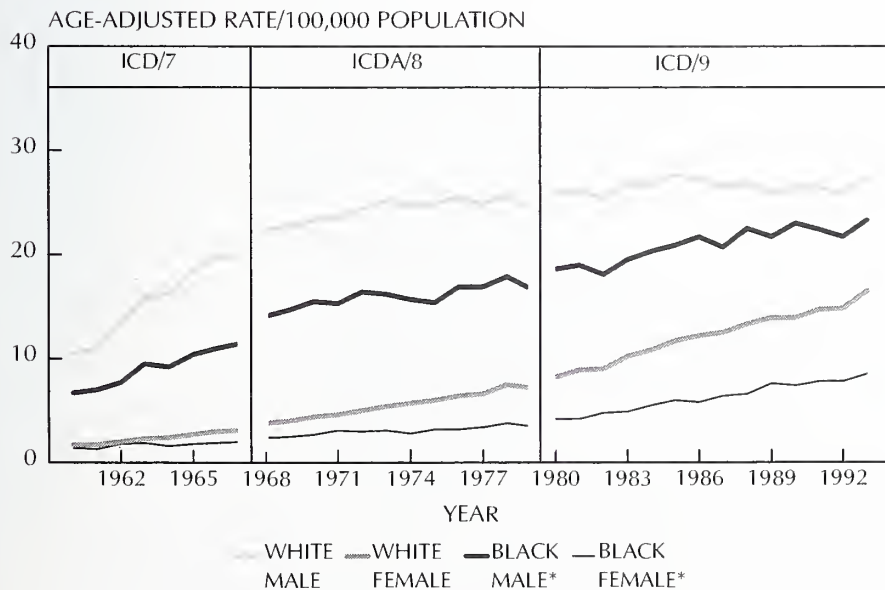
Since 1980, the age-adjusted death rate for COPD:[7,17,43]

- Is leveling off in white males.

- Is increasing in black males.

- Is increasing at a greater rate in females than in males.

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CHART 4-9
DEATH RATES FOR COPD
IN MALES BY AGE AND RACE, U.S., 1960-1993

RATE/100,000 POPULATION

YEAR

●45-54　　　55-64　●65-74　●75-84　—85+
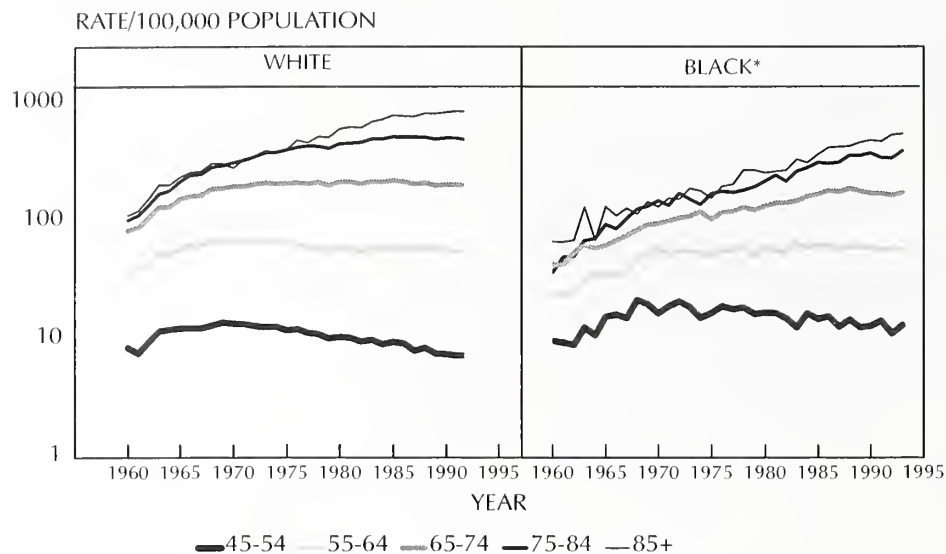
* Nonwhite from 1960 to 1967.

In the latter part of the 1980s, a peak in COPD mortality in males was reached in each age group except age 85 and older in white men and age 75 and older in black men.[7,17,43]

CHART 4-10
DEATH RATES FOR COPD
IN FEMALES BY AGE AND RACE, U.S., 1960-1993

RATE/100,000 POPULATION

YEAR

●45-54　　　55-64　●65-74　●75-84　—85+
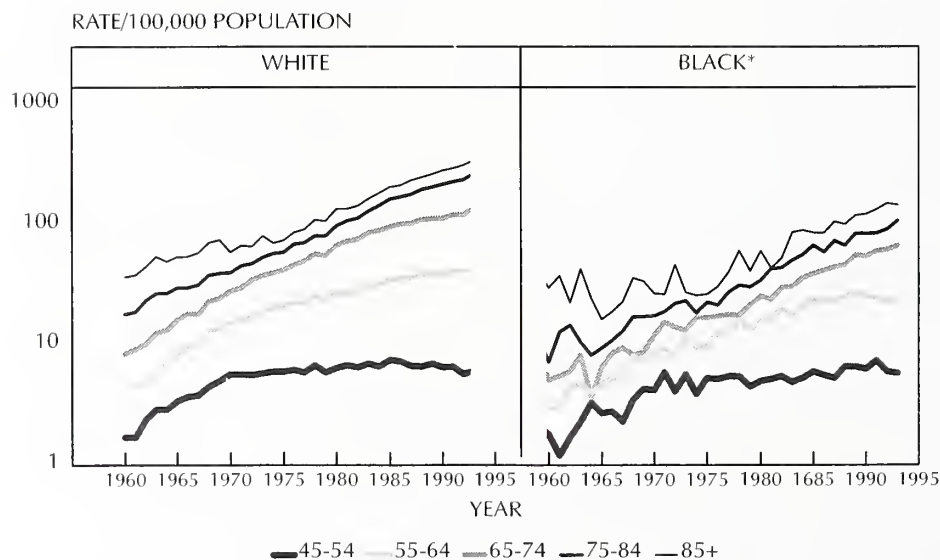
* Nonwhite from 1960 to 1967.

In the latter part of the 1980s, a peak in COPD mortality in females was reached in white females younger than age 55 and in black females younger than age 65; increases for older females continue.[7,17,43]

**CHART 4-11
AGE-ADJUSTED DEATH RATES FOR COPD
BY STATE, U.S., 1989-1991**
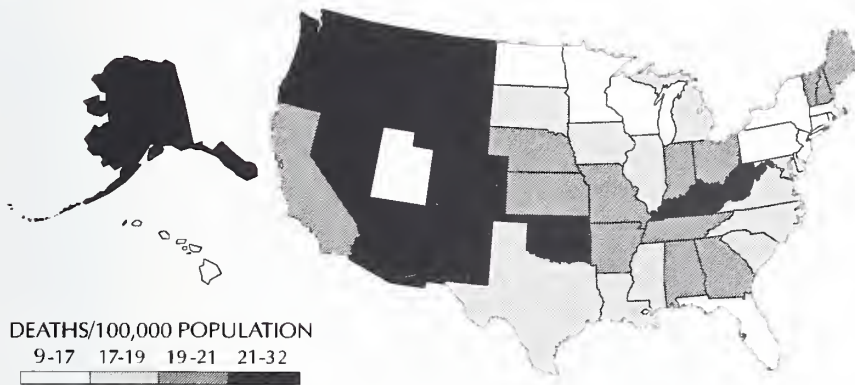
COPD death rates are highest in the western mountain states and are high in the eastern mountain states.[7]

DEATHS/100,000 POPULATION
9-17   17-19   19-21   21-32

**CHART 4-12
DEATH RATES FOR COPD AND ALLIED CONDITIONS
BY COUNTRY AND SEX, AGE 35-74, 1993**
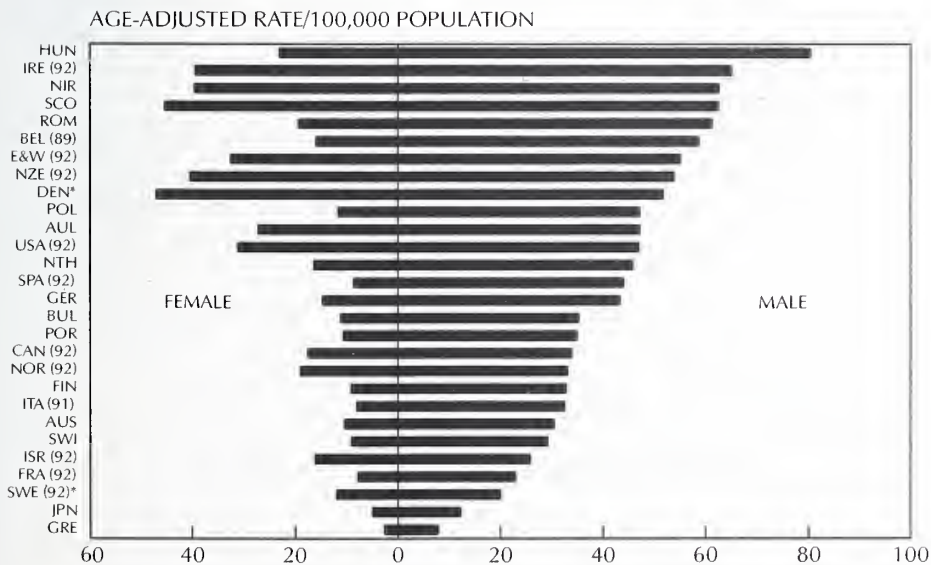
Among 28 industrial countries, the United States ranks 12th in COPD mortality for males and 7th for females.[44]

AGE-ADJUSTED RATE/100,000 POPULATION

HUN
IRE (92)
NIR
SCO
ROM
BEL (89)
E&W (92)
NZE (92)
DEN*
POL
AUL
USA (92)
NTH
SPA (92)
GER   FEMALE   MALE
BUL
POR
CAN (92)
NOR (92)
FIN
ITA (91)
AUS
SWI
ISR (92)
FRA (92)
SWE (92)*
JPN
GRE

60   40   20   0   20   40   60   80   100

* Eighth revision of the *International Classification of Diseases.*

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Chronic Obstructive Pulmonary Disease

CHART 4-13
DEATH RATES FOR COPD
BY RACE AND SEX, U.S., 1993

AGE-ADJUSTED RATE/100,000 POPULATION

TOTAL   WHITE   BLACK
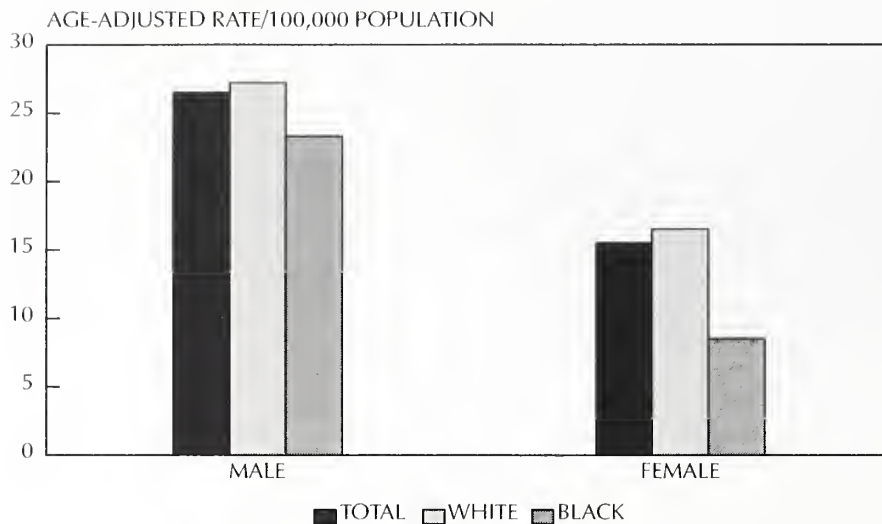
Age-adjusted death rates from COPD are:[17]

- **Higher in white males than in black males.**

- **Twice as high in white females as in black females.**

- **Higher in males than in females.**

CHART 4-14
DEATH RATES FOR COPD
BY AGE, RACE, AND SEX, U.S., 1993

RATE/100,000 POPULATION

AGE

WHITE MALE   WHITE FEMALE   BLACK MALE   BLACK FEMALE
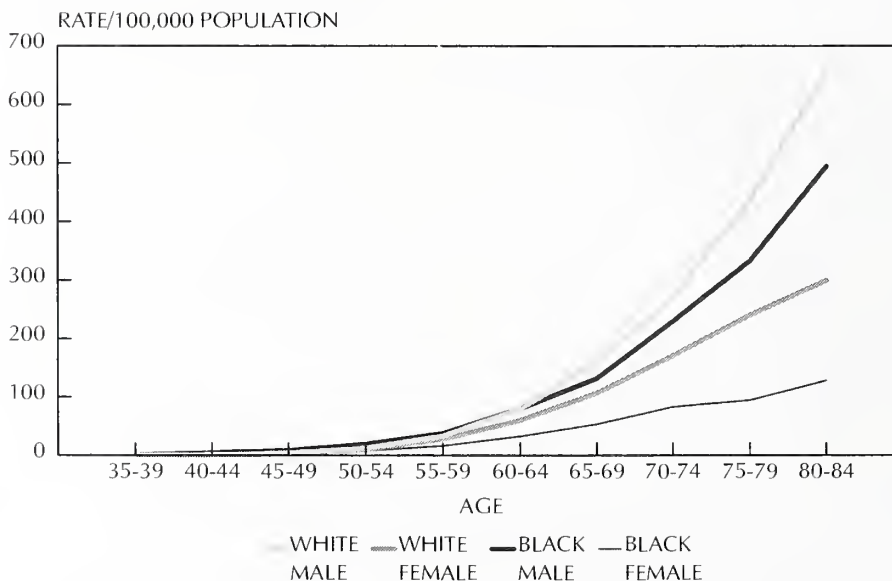
Age-specific death rates from COPD are:[17]

- **Much higher in males than females in almost all age groups.**

- **Higher in black males than in white males until about age 60, after which rates are much higher in whites.**

- **Lowest in black females.**

Asthma

**CHART 4-15
PREVALENCE OF ASTHMA BY AGE,
NHIS, U.S., 1970-1994**

PREVALENCE (MILLIONS)

YEAR

■ UNDER 18 ▨ 18-44 □ 45+

* Younger than age 17.
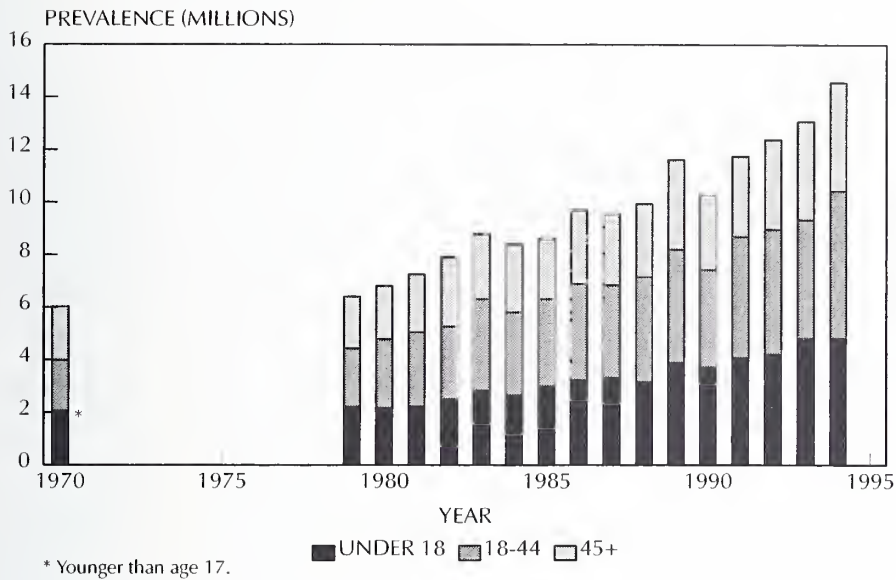
Total prevalence of asthma increased appreciably between 1979 and 1994, reaching 14.6 million persons in 1994. The increase occurred in all three age groups shown.[13,35,42]

**CHART 4-16
PREVALENCE RATE OF ASTHMA
BY AGE, NHIS, U.S., 1978-1994**

PREVALENCE/1,000 POPULATION

YEAR

━ <18 ━ 18-44 ━ 45-64 ━ 65+
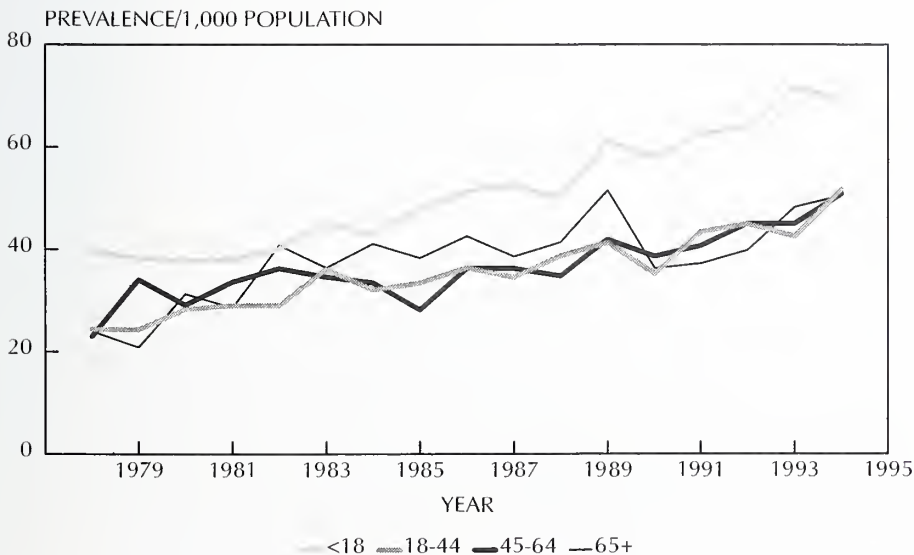
The prevalence rate of asthma is slowly increasing in most age groups, especially younger than age 18.[13,35]

Asthma

CHART 4-17
NUMBER OF HOSPITALIZATIONS FOR ASTHMA, U.S., 1971-1993

NUMBER (THOUSANDS)

YEAR
■ FIRST-LISTED ▨ SECONDARY
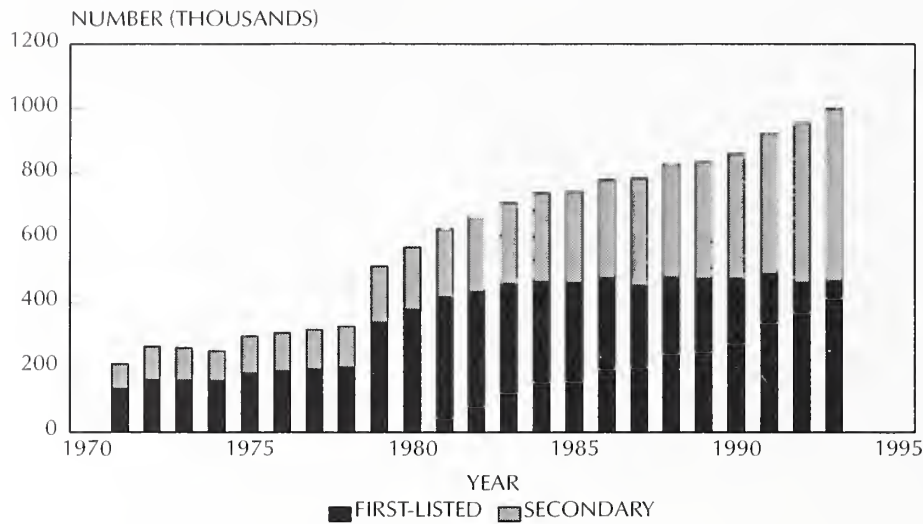
The number of hospital discharges for asthma as the first-listed discharge on the hospital face sheet has held relatively steady at just over 400,000 per year from 1981 to 1993. Asthma as a secondary diagnosis increased steadily during that period so that by 1993, asthma was the primary or secondary diagnosis in 1 million hospitalizations.[26,36]

CHART 4-18
HOSPITALIZATION RATES FOR ASTHMA BY AGE, U.S., 1971-1993

RATE/100,000 POPULATION

YEAR
<15 ▬15-44 ▬45-64 ▬65+
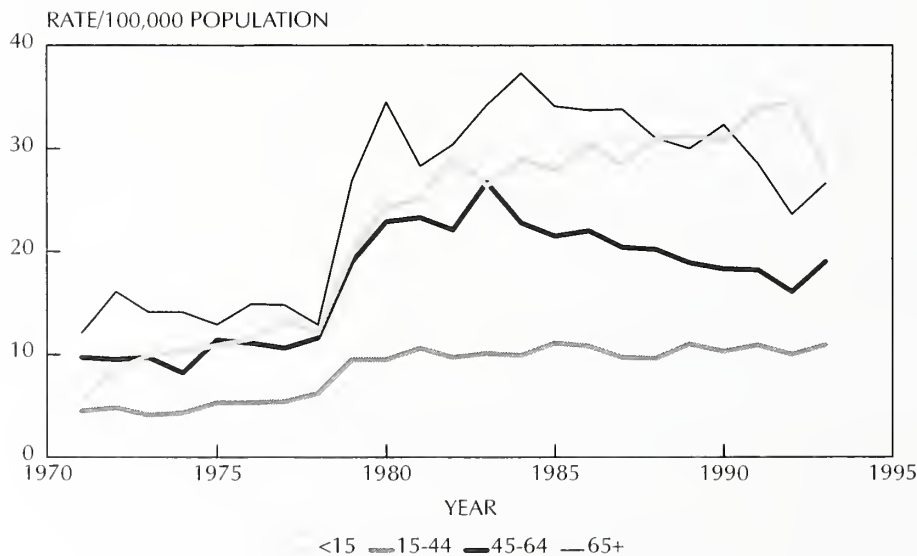
Hospitalization rates for asthma by age tended to increase from 1971 to 1993.[26,36]

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Asthma

CHART 4-19
DEATH RATES FOR ASTHMA AGE 1 TO 24
BY SEX AND RACE, U.S., 1979-1993

AGE-ADJUSTED RATE/100,000 POPULATION

YEAR

WHITE —WHITE —BLACK —BLACK
MALE   FEMALE   MALE   FEMALE
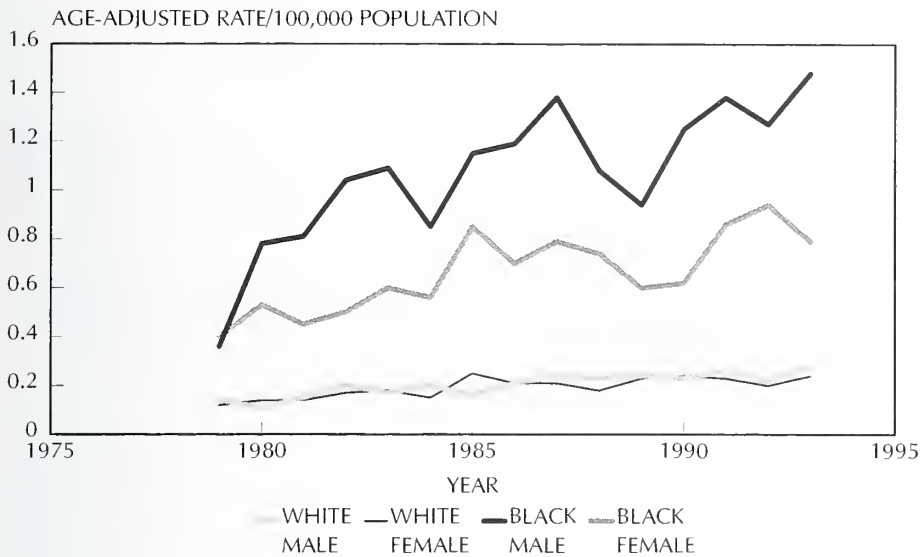
Death rates for asthma in persons for age 1 to 24 increased during the 1979-1993 period in the four race-sex groups shown. Because rates are higher in blacks than in whites, the absolute increase was greater in blacks, but the rates of increase were about the same. Essentially no change occurred in the black-white gap in death rates as calculated from the black/white ratios of the death rates.[7]

CHART 4-20
DEATH RATES FOR ASTHMA
BY AGE, U.S., 1968-1993

RATE/100,000 POPULATION

YEAR

—15-24 —25-34   35-44 - -45-54
—55-64   65-74 —75-84 —85+
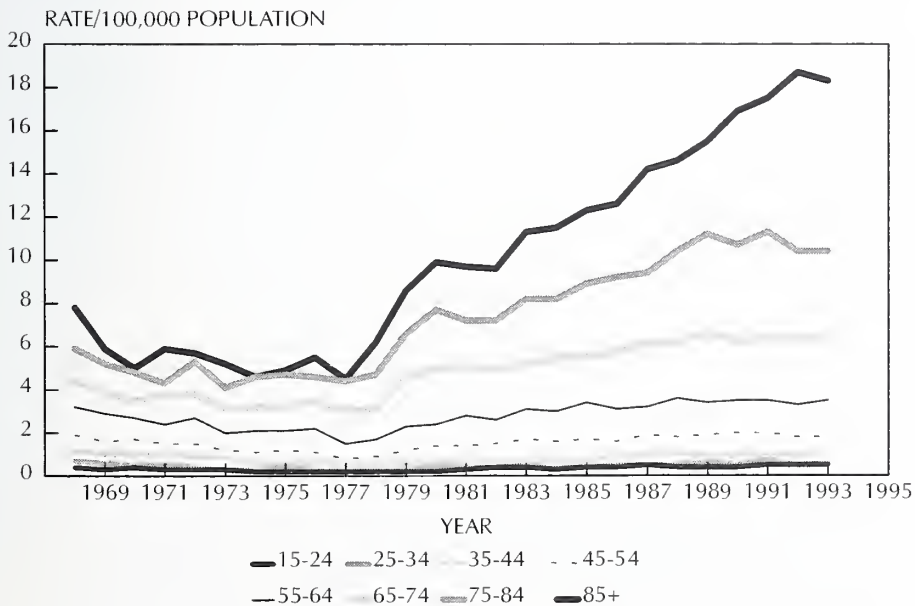
The fall and rise in asthma mortality since 1968 has occurred in all age groups.[7,17]

Asthma

CHART 4-21
DEATH RATES FOR ASTHMA
BY RACE AND SEX, U.S., 1993

AGE-ADJUSTED RATE/100,000 POPULATION

■TOTAL ☐WHITE ▨BLACK
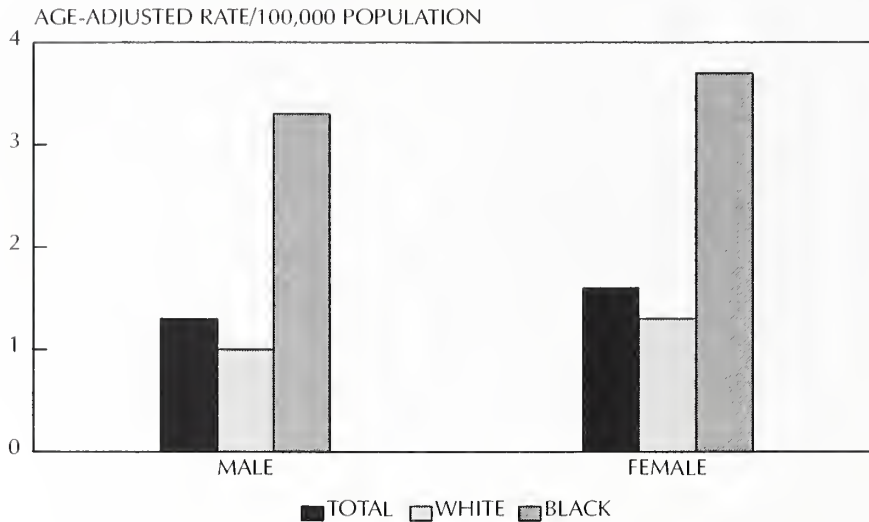
Age-adjusted death rates for asthma are:[17]

- **Three times higher in black males than in white males.**

- **Almost three times higher in black females than in white females.**

- **Slightly higher overall in females than in males.**

CHART 4-22
DEATH RATES FOR ASTHMA
BY AGE, RACE, AND SEX, U.S., 1993

RATE/100,000 POPULATION

AGE

WHITE ▬WHITE ▬BLACK ▬BLACK
MALE FEMALE MALE FEMALE
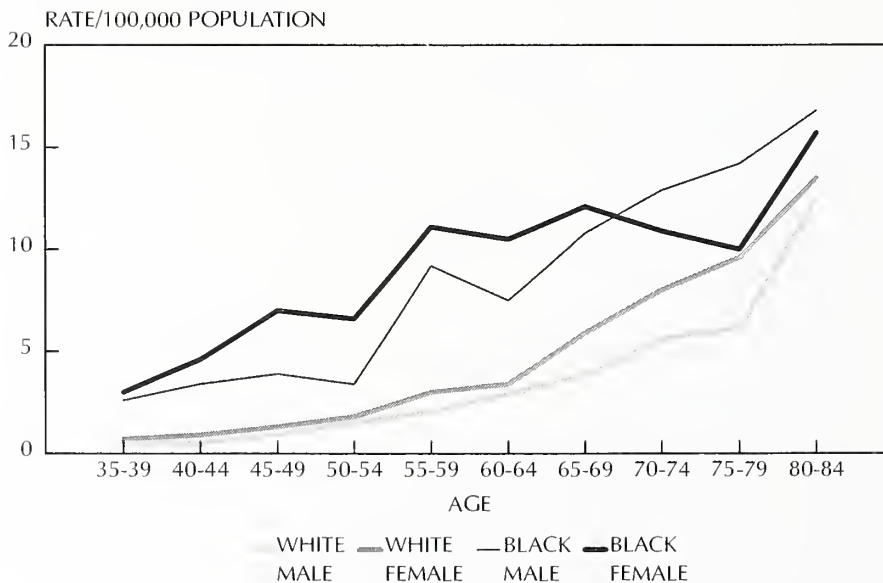
Age-specific death rates for asthma are much higher in blacks than in whites in nearly every age group.[17]

The rates are higher in white females than in white males.

60

Asthma

**CHART 4-23
DEATH RATES FOR ASTHMA
BY SEX, U.S., 1951-1993**

AGE-ADJUSTED RATE/100,000 POPULATION

YEAR

MALE ▬FEMALE
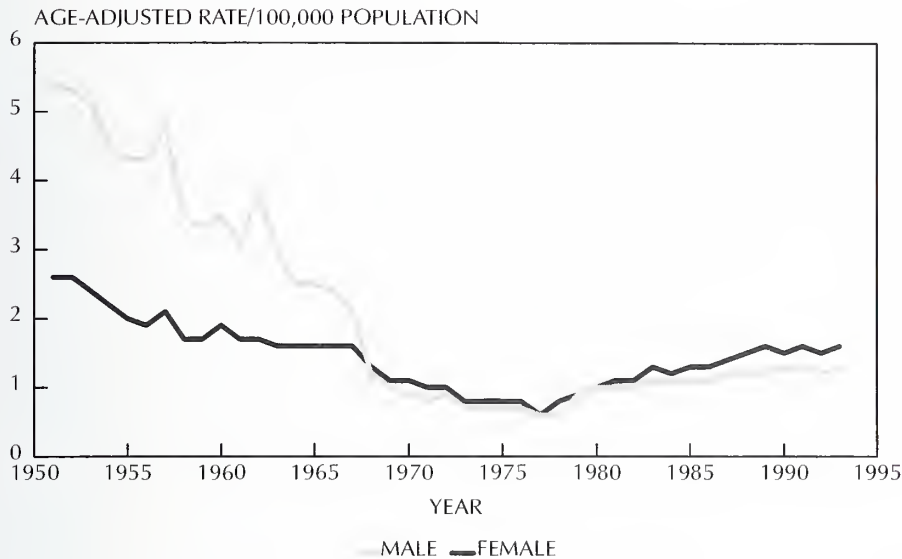
Asthma mortality shows a steep decline up to 1968 and is then followed by an increase.[7]

Rates had been much higher in males than in females before the mid-1960s but are now about the same for both sexes.

**CHART 4-24
DEATH RATES FOR ASTHMA
BY RACE, U.S., 1951-1993**

AGE-ADJUSTED RATE/100,000 POPULATION

YEAR

WHITE ▬BLACK*

* Nonwhite from 1951 to 1967.
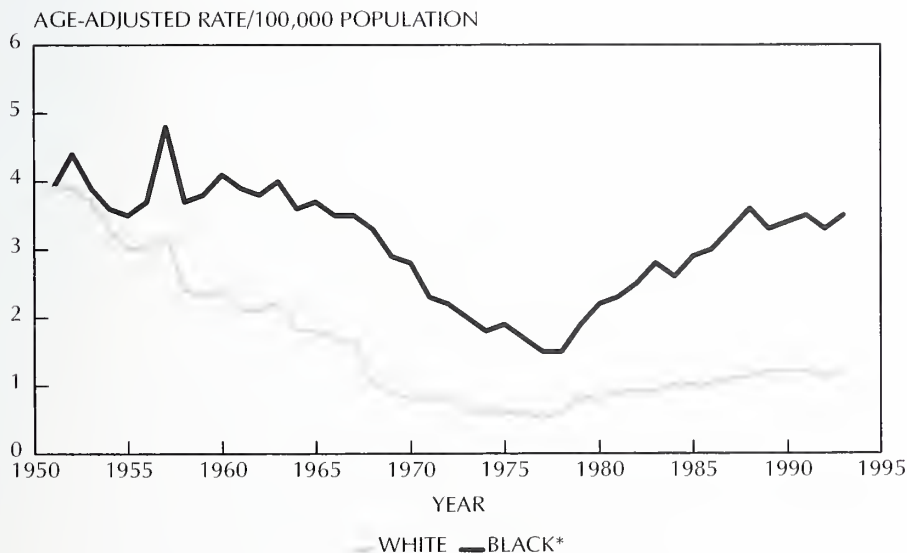
The black-white gap in asthma mortality is widening, with rates much higher in blacks than in whites.[7]

Asthma

CHART 4-25
DEATH RATES FOR ASTHMA
BY RACE AND SEX, U.S., 1951-1993

AGE-ADJUSTED RATE/100,000 POPULATION

WHITE	WHITE	BLACK*	BLACK*
MALE	FEMALE	MALE	FEMALE
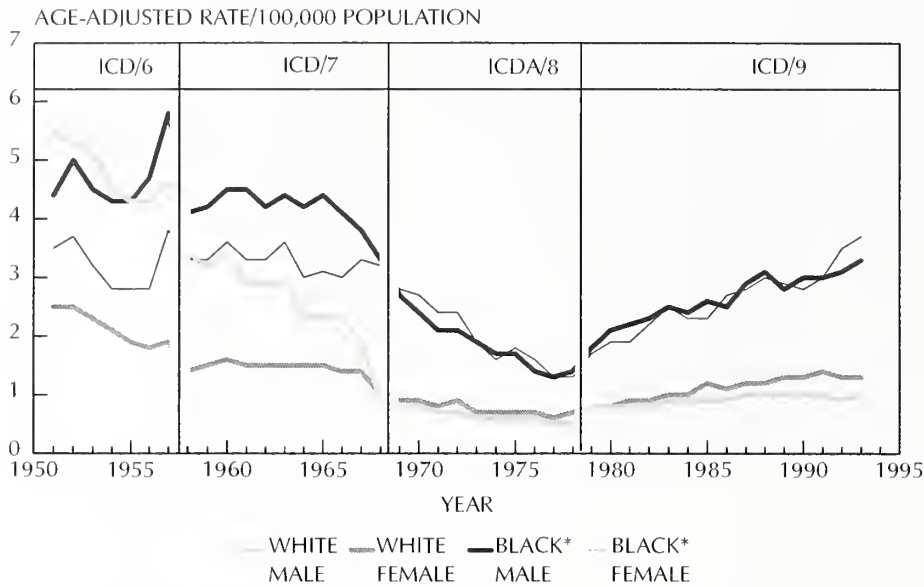
* Nonwhite from 1950 to 1967.

Trends in asthma mortality are much more uniform across sex-race groups since 1970 as compared with the 1950-1970 period.[7]

CHART 4-26
PHYSICIAN OFFICE VISITS FOR ASTHMA,
U.S., 1979-1993

VISITS (MILLIONS)
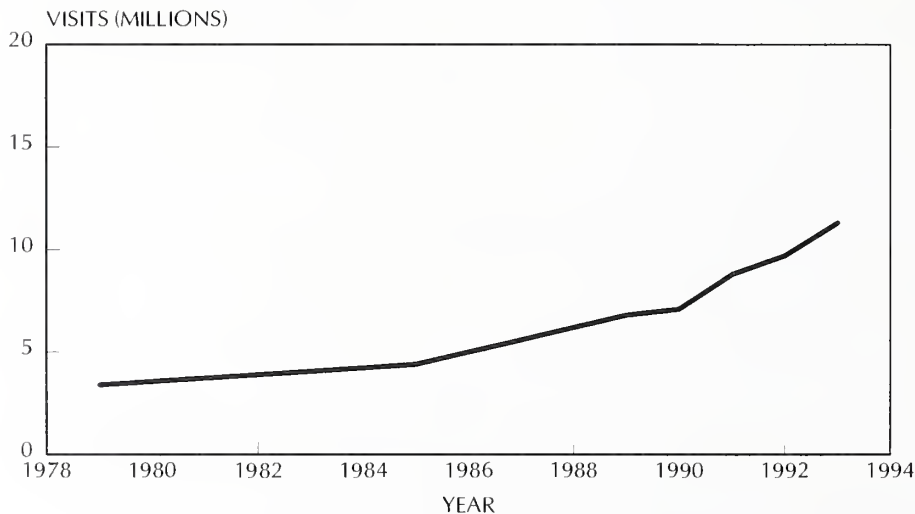
The number of physician office visits for asthma increased substantially during the 1979-1993 period and rapidly since 1990.[45]

Neonatal Respiratory Distress Syndrome

CHART 4-27
INFANT MORTALITY RATE FOR NEONATAL RDS,
U.S., 1968-1994

DEATHS/100,000 LIVE BIRTHS

YEAR
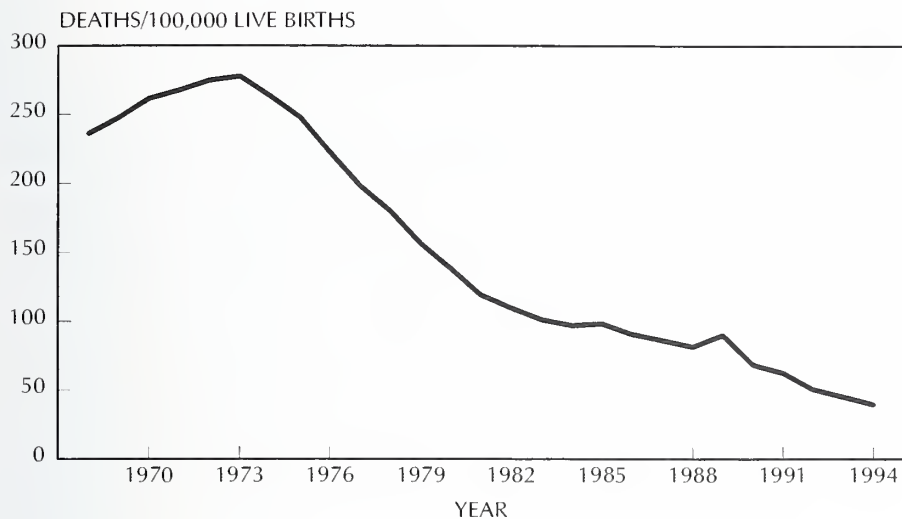
The infant death rate for neonatal respiratory distress syndrome (RDS) declined steeply from 1973 to 1981, followed by a slower but appreciable decline to 1994.[7,21]

CHART 4-28
INFANT MORTALITY RATE FOR NEONATAL RDS BY RACE,
U.S., 1979-1993

RATE/100,000 LIVE BIRTHS

YEAR

BLACK ▬WHITE

Source: Vital statistics of the U.S., NCHS.
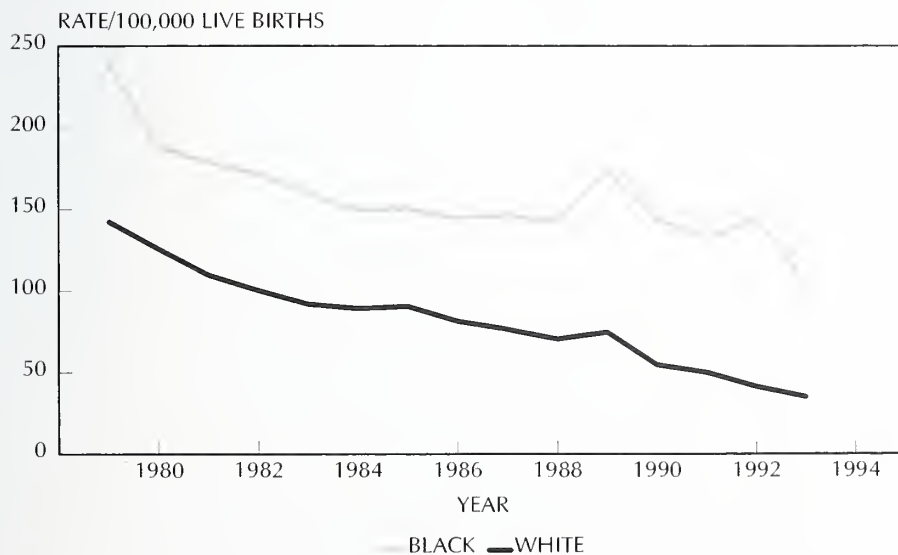
Decline in the infant death rate for neonatal RDS from 1979 to 1993 has been appreciable in both blacks and whites.[7,21]

5. Blood Diseases

The diagnostic group "Blood Diseases" is used in this chartbook to mean only those diagnostic categories in the ICD chapter on "Diseases of the Blood and Blood-Forming Organs" (refer to pie chart below). Blood clotting diseases, most of which are subsumed under CVD, are not included in this chartbook, nor are other blood diseases such as bleeding and red blood disorders of the newborn or serum hepatitis. Blood transfusion and resources statistics are also not included. A relatively detailed list of the blood diseases is given in the first table in this section together with the appropriate ICD/9 codes. Estimates on hospital discharges, lengths of stay, physician office visits, and deaths for 1993 are included. Graphs that follow are on sickle-cell anemia and aplastic anemia. In addition to the usual data limitations, the numbers on which these statistics are based are quite small. For that reason, some graphs are based on mortality from the 11 years of 1980 to 1990 combined.

CHART 5-1
BLOOD DISEASE DEATHS,
PERCENT BY SUBGROUP, U.S., 1993

OTHER ANEMIAS 30.9%

APLASTIC ANEMIA 13.6%

OTHER 29.2%

COAGULATION DEFECTS 13.1%

HEMORRHAGE 8.8%

DISEASES OF WHITE BLOOD CELLS 4.5%
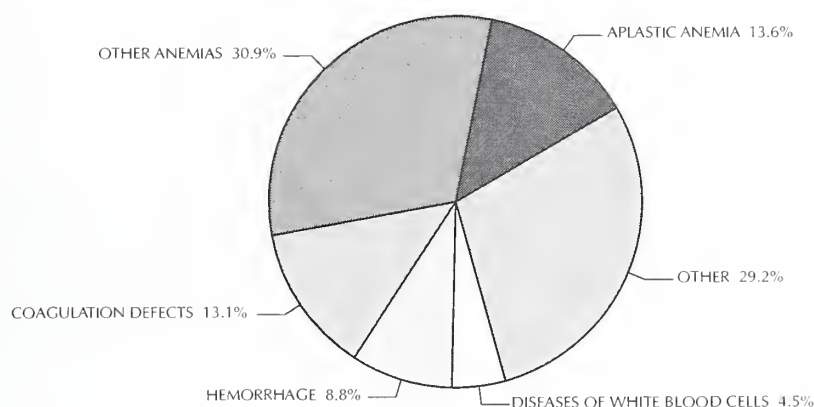
Total Deaths = 9,709 (100%).

Blood Diseases

DIAGNOSTIC CATEGORY	ICD/9 CODES	HOSPITALIZATIONS FIRST-LISTED DISCHARGE (000)	HOSPITALIZATIONS LENGTH OF STAY (DAYS)	PHYSICIAN OFFICE VISITS (000)	DEATHS
Blood diseases—total*	280-289	327	5.8	4,286	9,709
Anemias—total	280-285	214	5.6	2,694	4,315
Iron deficiency anemia	280	39	5.5	337	98
Other deficiency anemia	281	6	7.7	500	184
Cooley's anemia	282.4	8	2.1	17	39
Sickle-cell anemia	282.6	53	6.5	28	456
Aplastic anemia	284	25	6.6	20	1,318
Other and unspecified anemias	Residual	83	5.3	1,792	2,220
Coagulation defects	286	14	7.5	101	1,269
Hemophilia: factor VII	286.0	0	0.0	0	78
Hemophilia: factor IX	286.1	0	0.0	0	4
Other	Residual	14	7.5	101	1,187
Purpura and other hemorrhagic conditions	287	30	6.8	333	852
Primary thrombocytopenia	287.3	13	6.4	73	312
Secondary thrombocytopenia	287.4	6	6.5	0	3
Other	Residual	11	7.5	260	537
Diseases of white blood cells	288	38	6.6	59	440
Other diseases of blood and blood-forming organs	289	30	4.3	1,099	2,833

* Includes diseases in the ICD chapter on Diseases of Blood and Blood-Forming Organs.
NOTE: Estimates of hospitalizations and physician office visits are subject to sampling variability. Estimates of hospitalizations below 50,000 have a relative standard error of more than 11 percent. Estimates of physician office visits below 588,000 have a relative standard error of more than 30 percent.
Compiled from references 17, 26, 27.

Anemias

CHART 5-3
HOSPITAL DISCHARGES FOR APLASTIC ANEMIA,
U.S., 1982-1993

DISCHARGES (THOUSANDS)

YEAR

DIAGNOSIS OF APLASTIC ANEMIA
■ FIRST-LISTED ▨ SECONDARY
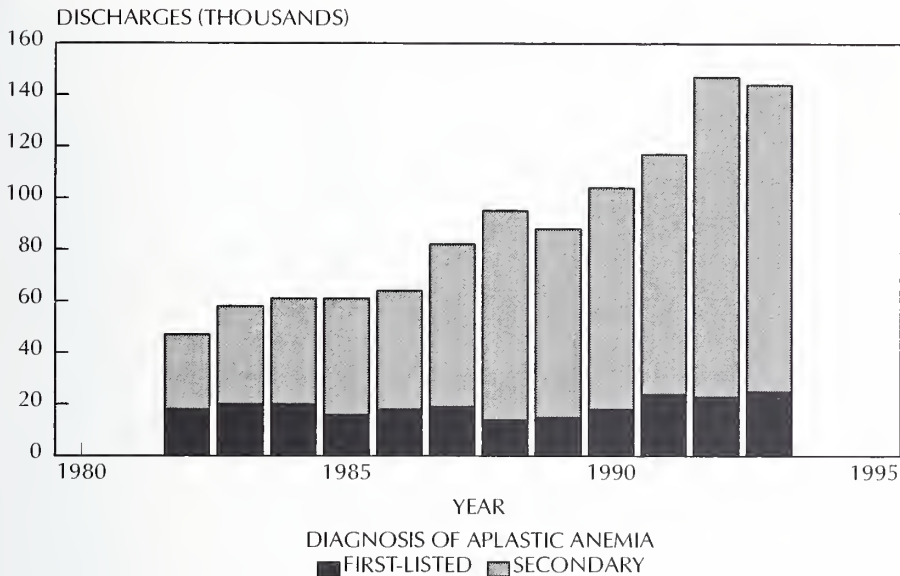
The number of hospital discharges for aplastic anemia as a primary or secondary diagnosis tripled between 1982 and 1993, but all of the increase occurred for aplastic anemia as a secondary diagnosis.[26,36]

CHART 5-4
HOSPITAL DISCHARGES FOR SICKLE-CELL ANEMIA
BY AGE, U.S., 1982-1993

RATE/10,000 POPULATION

YEAR

— 15-44 ▬ YOUNGER THAN 15

NOTE: All discharges for this disease are assumed to be in the black population.
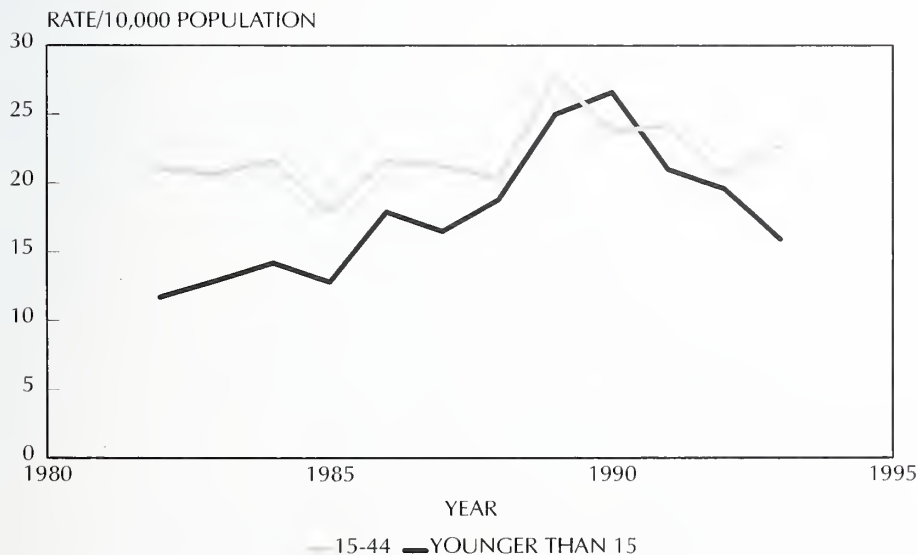
In blacks younger than age 45, the rate of hospital discharges for sickle-cell anemia as the first-listed discharge on the hospital face sheet increased between 1982 and 1989, followed by a sharp decline.[26,36]

Anemias

CHART 5-5
DEATH RATES FOR APLASTIC ANEMIA
BY RACE AND SEX, U.S., 1980-1990

AGE-ADJUSTED DEATH RATE/1,000,000 POPULATION*

■TOTAL □WHITE ■BLACK
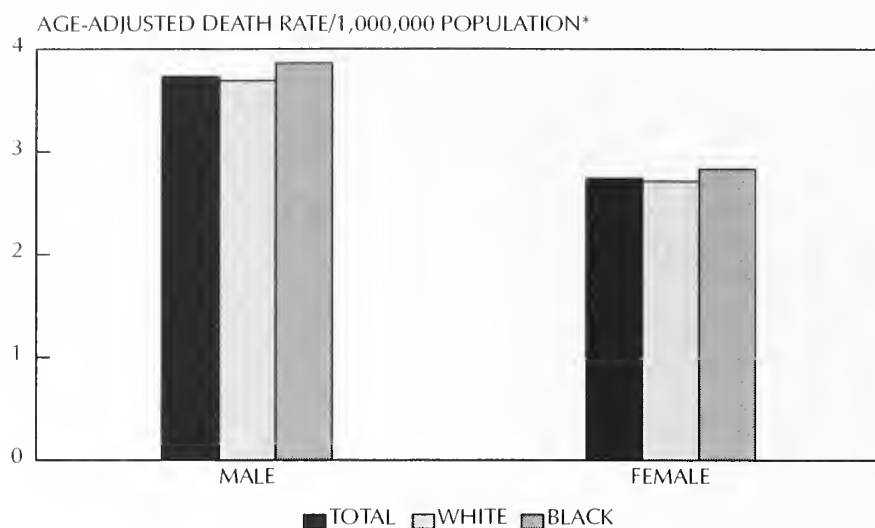
* Average annual rates.

Mortality from aplastic anemia is higher in males than in females.[7]

There is no appreciable difference by race.

CHART 5-6
DEATH RATES FOR APLASTIC ANEMIA
BY AGE, RACE, AND SEX, U.S., 1980-1990

DEATH RATE/1,000,000 POPULATION*

YEAR

WHITE ▬WHITE ▬BLACK ▬BLACK
MALE FEMALE MALE FEMALE
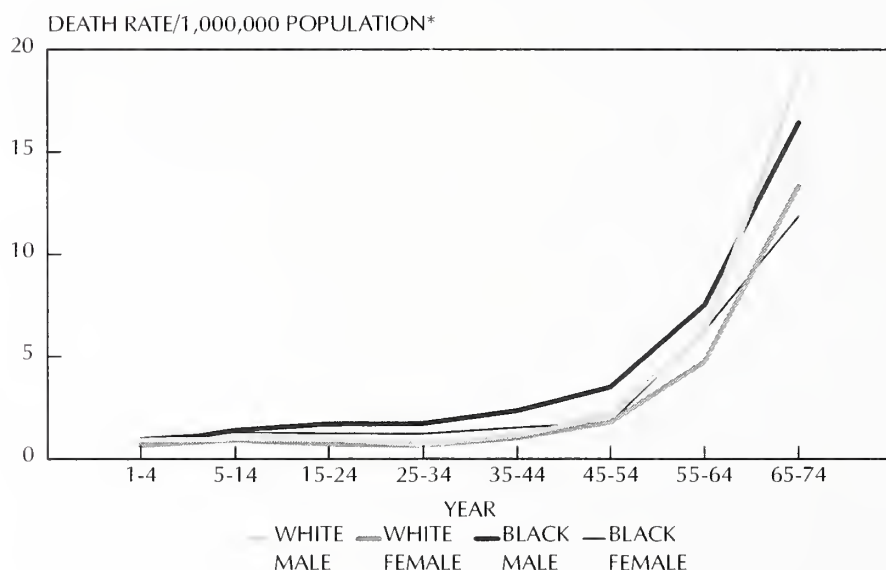
* Average annual rates.

No striking race or sex difference in mortality from aplastic anemia exists in those younger than age 65.[7]

Mortality from aplastic anemia for white males older than age 65 is the highest among the four race-sex groups.

Anemias

CHART 5-7
DEATH RATES FOR SICKLE-CELL ANEMIA
BY RACE AND SEX, U.S., 1980-1990

AGE-ADJUSTED DEATH RATE/1,000,000 POPULATION*

■TOTAL □WHITE ▓BLACK
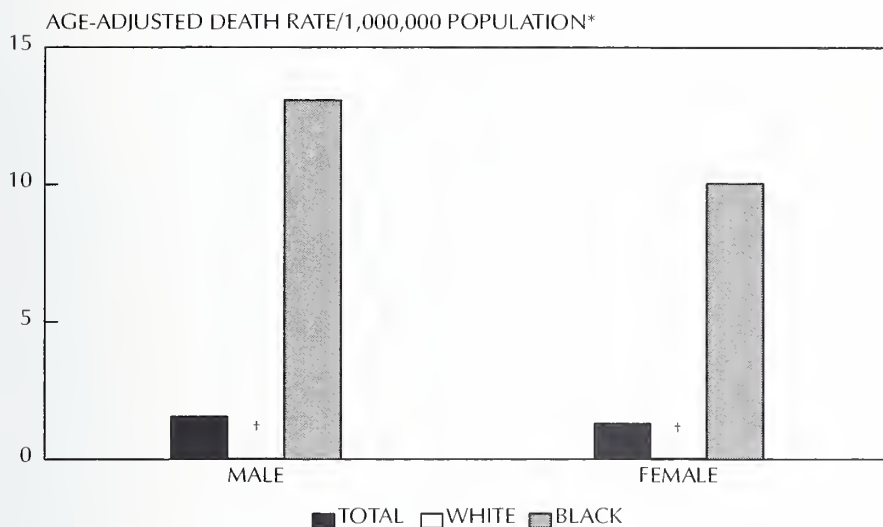
* Average annual rates.
† Rates for white males and females are less than ½ of 1 percent.

Mortality from sickle-cell anemia occurs predominantly in blacks.[7]

The age-adjusted death rate is slightly higher in black males than in black females.

CHART 5-8
DEATH RATES FOR SICKLE-CELL ANEMIA
BY AGE AND SEX IN BLACKS, U.S., 1980-1990

DEATH RATE/1,000,000 POPULATION*

BLACK ▬BLACK
MALE FEMALE
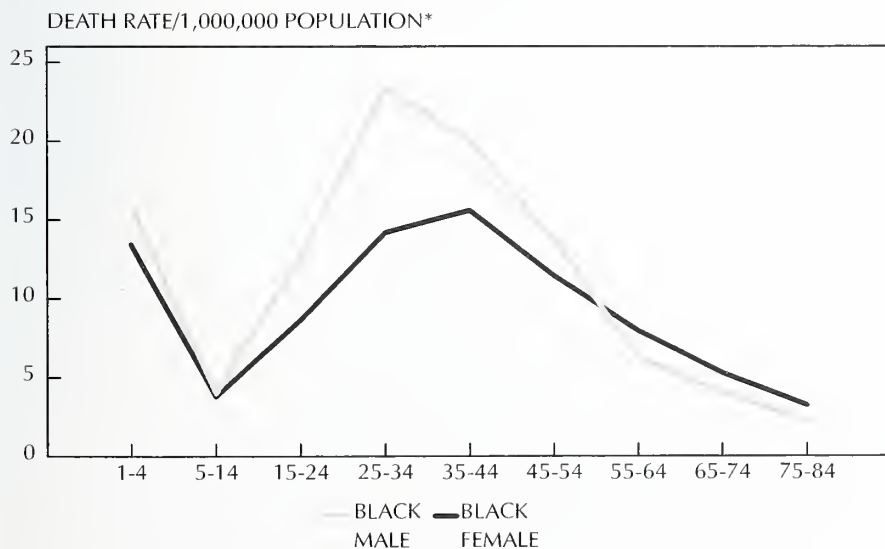
* Average annual rates.

Mortality from sickle-cell anemia is high in those younger than age 5 and again between 15 and about age 60, after which rates are low again.[7]

Definition of Terms

Age-adjusted death rate:
The age-adjusted death rate is a summary death rate for the given age range and is computed by the direct method, that is, by applying the age-specific death rates for a given cause of death to the standard population (United States, 1940) distributed by age in 10-year age groups.[3]

Chronic condition:
A condition is considered chronic if: (1) the respondent (in a health interview) indicates it was first noticed more than 3 months before the reference date of the interview, or (2) it is a type of condition that ordinarily has a duration of more than 3 months.[13]

Comparability ratio:
The comparability ratio is the number of deaths from a particular cause of death as coded to an ICD revision divided by the number of deaths from the closest similar cause of death as coded to the preceding ICD revision. This dual coding is done on a sample of death certificates for a particular year. These ratios measure discontinuities in mortality data resulting from introduction of a new ICD revision.[2]

Hospital discharge:
Discharge is the formal release of a hospital inpatient, that is, termination of a period of hospitalization by death or by disposition to place of residence, nursing home, or another hospital. First-listed diagnosis is the coded diagnosis identified as the primary diagnosis or that diagnosis listed first on the face sheet of the hospital medical record. Hospital means non-Federal, short-stay special and general hospital of six beds or more for inpatient use and an average length of stay of less than 30 days.[26]

Incidence:
Incidence is the number of cases that had their onset during a specified period of time.[13]

Infant mortality rate:
The infant mortality rate is the number of deaths from a cause of death (or all causes) occurring at younger than age 1 in a particular year divided by the number of live births occurring that year, expressed as a rate per 1,000 live births.[17]

Limited in activity:
Also called chronic activity limitation, it refers to the limitation of a person's usual activity due to a chronic condition.[13]

Morbidity:
For this chartbook, morbidity refers to incidence, prevalence, hospitalizations, and physician office visits.

Prevalence:
The prevalence of a condition is the number of persons who have the condition at a given time.[13]

Standard error:
The standard error is primarily a measure of sampling error (not measurement error), that is, the variation that might occur by chance because only a sample of the population is surveyed. The relative standard error of an estimate is obtained by dividing the standard error of the estimate by the estimate itself.[13]

Underlying cause of death: The underlying cause of death is the disease or injury that initiated the events leading directly to death. It is selected from the conditions entered in the cause-of-death section of the death certificate. When more than one cause or condition is entered by the physician, the underlying cause is determined by the sequence of conditions on the certificate, provisions of the ICD, and associated classification rules.[17]

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Appendix

International Classification of Diseases: Codes for Selected Diagnostic Categories: Sixth, Seventh, Eighth, and Ninth Revisions

Diagnostic Term in Chartbook	ICD/6 1949-1957	ICD/7 1958-1967	ICDA/8 1968-1978	ICD/9 1979-1987
Cardiovascular diseases[a]	330-334, 400-468	330-334, 400-468	390-458	390-459
Heart disease	400-402, 410-443	400-402, 410-443	390-398, 402, 404-429	390-398, 402, 404-429
Coronary heart disease[b]	420	420	410-413	410-414
Acute myocardial infarction	*	*	410	410
Heart failure[c]	†	†	427.0, 427.1	428
Rheumatic heart disease[d]	400-402, 410-416	400-402, 410-416	390-398	390-398
Cerebrovascular diseases (stroke)[e]	330-334	330-334	430-438	430-438
Diseases of arteries	450-456	450-456	440-448	440-448
Congenital anomalies of the circulatory system[f]	†	†	746-747	745-747
Chronic obstructive pulmonary disease[g]	500-502, 527.1	500-502, 527.1	490-492, 519.3	490-492, 494-496
Asthma	241	241	493	493

[a] The ICD term is diseases of the circulatory system.
[b] The ICD/6 and ICD/7 term is arteriosclerotic heart disease; the ICDA/8 and ICD/9 term is ischemic heart disease.
[c] The ICDA/8 terms are congestive heart failure and left ventricular failure. The ICD/9 term is heart failure.
[d] The ICD/6 and ICD/7 terms are rheumatic fever and chronic rheumatic heart disease. The ICD/9 terms are active rheumatic fever and chronic rheumatic heart disease.
[e] The ICD/6 and ICD/7 term is vascular diseases affecting the central nervous system; the ICDA/8 and ICD/9 term is cerebrovascular disease.
[f] The ICDA/8 terms are congenital anomalies of heart and other congenital anomalies of circulatory system. The ICD/9 terms are bulbus cordis anomalies and anomalies of cardiac septal closure, other congenital anomalies of heart, and other congenital anomalies of circulatory system.
[g] The ICD/6 and ICD/7 terms are chronic bronchitis, unqualified bronchitis, and emphysema without mention of bronchitis; the ICDA/8 terms are chronic bronchitis, unqualified bronchitis, emphysema, and chronic obstructive lung disease; the ICD/9 terms are chronic bronchitis, bronchitis not specified as acute or chronic, emphysema, bronchiectasis, extrinsic allergic alveolitis, and chronic airways obstruction not elsewhere classified.
* No code for this category exists in this ICD revision.
† No data for this category are presented in the chartbook in this period.